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EDITORIAL NOTES.

The Judgment in the Taff Vale Case.

AFTER a hearing which occupied fourteen days of the time of Mr. Justice Wills and a Special Jury, in the King's Bench Division, the great case of the Taff Vale Railway Company against the Amalgamated Society of Railway Servants, and the principal officials of this Trade Union, terminated on Friday in a sweeping verdict for the plaintiff Company for damages and costs. It is understood that questions relating to the figures of the damages and costs will be argued after the Vacation, and that there may be an appeal on certain points of law, such as ingenious advocates can always raise in respect to big actions covering a great deal of ground. But the verdict of the Jury is an accomplished fact, which no subsequent proceedings can annul. It could not have been different upon the evidence. The result is nothing short of a revolution in the domain which Trade Unionism of the kind represented by the Society of Railway Servants had been successful in carving out of the organized industries and public services of the country. Of course, those newspapers which cultivate Labour politics, and accept the assumption that the interests of the mechanic and labouring classes are identified with the cause of Trade Unionism as it had come to be understood by leaders and hangers-on of these Associations, have promptly proclaimed the judgment as a "blow to Unions." It seems to be scarcely worth while arguing that it is nothing of the kind, but is a much-needed demolition of the fabric of presumptuous irresponsibility, official tyranny, and unfair interference with the liberty of the subject, that had been erected on the basis of Trade Unionism, by scheming individuals, taking full advantage of their personal insignificance and the indifference of the powers of law and order to their machinations. It is the birthright of every Briton that he shall not be interfered with so long as he does not invade the equal right of another. Consequently, not a man in this country is required to ask anybody's leave to start or become a member of any lawful society, club, or union. The executives of these voluntary associations, again, can pursue the objects which they profess without asking leave or liberty of anyone.

So far all is plain sailing; but in the development of Trade Union principles and the working of these organizations, the condition precedent for the exercise of individual and collective freedom dropped out of sight, and was completely ignored. It came to be presumed that nobody but a Trade Unionist had any rights which the Society was bound to respect. By a misunderstanding of the statutory protection which is accorded to this particular class of society against domestic litigation—viz., the provision that a Trade Union, duly registered as such under the Act, cannot either sue or be sued, like a corporation "with perpetual succession and "a common seal"—it came to be presumed that these organizations could not be held legally responsible for their actions. The result was the setting up of an intolerable form of tyranny at the instance of the directors and managers of Trade Unions. They laid claim to the monopoly of employment wherever they could get a footing. Mere nobodies, without standing or stake to give them individual consideration, wielded the resources and powers of organizations rendered formidable by reason of the number and strength of their membership and the nature of the allegiance that they exacted from their adherents; and while the only thing that lent force to the orders and doings of these persons was the Union at their back, they pretended that the Union could not be held answerable for their proceedings. On this presumed footing, the Union officials fomented and conducted strikes, posted and instructed armies of pickets in order to prevent other men from earning their living, claimed all the attributes of executive power and influence, and posed as great people, the equals, if not the superiors, of company directors—responsible managers of undertakings amenable to the law for all their ministerial actions. Besides all this, they assumed authority to sign declarations of industrial war and treaties of peace.

All this time the presumption was baseless. The time came when the plain issue of the liability of a Trade Union for the wrongful actions of its agents was raised with respect to a specific case; and it was determined in the only possible sense. It seems wonderful, and it was certainly to be regretted, that the occasion for a declaration of the law on this head should have been so long delayed; but the British Constitution is like that. It knows nothing of abstractions; and every man is supposed to understand the law under which he lives. He may live long, and go to his grave, without ever coming into conflict with the law of the land. Most people do. But if a man, or an association of men, fall into an erroneous interpretation of the law on any point, they may expound their views, and base a political principle upon the mistake, and nobody will undeceive them in the name of the law, so long as they do not carry the error into action to the injury of a subject of the King's Majesty. So it was in the Taff Vale case. The Amalgamated Society of Railway Servants carried on with a high hand, and their officials acted in the spirit acknowledged by Wolsey. Their end was precisely like his. They were "little wanton boys," who had ventured far beyond their depth; and when the disillusionment came, they, too, fell "like Lucifer."

The presumption of immunity of the Society having been destroyed by the interim litigation, the Taff Vale Company's lawsuit for damages due to the strike organized and carried on, if not literally ordered by the Society, proceeded on facts which could not be disputed. The narrative of the strike of August, 1900, when some 1200 to 1300 of the Railway Company's men left their employment—a large proportion of them breaking their contracts—need not be recounted here in any detail. It was marked by incidents of intimidation and violence, of the usual kind. Once more it was proved clearly that to break the bonds of discipline, and let loose the spirit of mutiny, cannot be done without the occurrence of consequences which those who originated the outbreak probably deplore as much as anybody. A strike leader may be as lofty-spirited a man as Hampden was; but he cannot sever himself from his followers, who eventually are his masters. So far as the effect of the judgment upon the position of the Unions is concerned, we venture to propound the opinion that it will do these Societies, in so far as they have any legitimate mission, nothing but good. It was extremely bad for them to carry on under the illusion that they were irresponsible bodies. The idea led to all manner of subterfuges and absurdities. Men who knew, or thought they knew, that the funds belonging to them as members of a Union could not be touched to pay for the vagaries of Society officials, were encouraged in carelessness as to the sayings and doings and characters of these gentry. Among uneducated, or only half-educated men, there is always a propensity to place confidence in the order of devices for escaping from responsibility which may be classified as belonging to the popular idea of low-class attorneyism. Against this habit of mind Mr. Justice Wills righteously fulminated. He declared that "Law Courts deal with realities and not with shams, and all "these ingenious sophistries and shuffling of the cards, and "attempts to evade responsibility, avail men nothing in "a Court of Justice." It was worth all the litigation to bring a sense of this truth before the working-class public, who have far too often acted like children for whom full responsibility before the law does not exist. It is matter for regret that, when the chosen or self-constituted leaders of the working classes set before their supporters the ideal of deliverance from the bondage of industrial servitude by the way of Trade Unionism, they should have fallen into the error of proposing a state of slavery in exchange for the condition of weakness of the wage-earner who stands alone. This mistake it was, and nothing else, which eventually brought Trade Unionism into conflict with the good common law of England, with results which every Trade Union executive is pondering over at the present moment.

A Gasholder Tank Contract.

An important question of principle is raised in the case of *Docwra and Son v. Hoddesdon Gas Company* reported in this week's "Legal Intelligence;" but, in its settlement, we are deprived, through the agreement of the parties, of the dictum on the matter of Mr. Justice Ridley, before whom the plaintiffs' claims only were argued. However, though it would not be becoming to say with any positiveness what his Lordship's judgment would have been had the proceedings been carried to the final stage, the significant remarks which fell from him during the hearing give one an indication of the trend of his view on the point, and this in all probability had something to do with the agreement arrived at, and which was favourable to the defendant Company. The question in dispute was one of liability in connection with a contract for the construction of a gasholder tank; and, reading the terms of the specification, and the admissions made so far as the case proceeded, it is really difficult to see where any doubt could exist as to the quarter in which the liability rested.

The action was to recover £1775, the balance of an account for goods supplied, and work done, in the construction of the tank in question. By way of counterclaim, the Company sought to recover various penalties—the tank not being water-tight even now. The dispute had its origin in the character of the soil in which the tank was constructed. The specification was drawn up on the assumption that the soil was composed of stiff clay; but in the specification were the qualifying words, "so far as is known" the soil "consists "of stiff clay." Notwithstanding these words, the plaintiffs submitted a tender obviously without making any investigations themselves, as they were perfectly at liberty to do, as to the character of the subsoil. They tendered under the indefinite specification as to the nature of that subsoil for the construction of a tank, consisting of a circular wall with a natural bottom, and took upon themselves the liability of making a good water-tight job of it. In fact, a clause of the tender ran: "We hereby undertake to execute *the necessary* "*work* for the construction of a water-tight tank." There is nothing obscure about this; and it is only common sense to say that the Contractors were willing, and did in fact, take upon themselves a certain risk. But when they came to excavate the soil, it was found to be composed of stiff clay for some distance from the surface, and then changed to clay and gravel until the undersoil contained a considerably larger percentage of gravel than clay. Thereupon consultations took place between the parties; and it was finally arranged that the bottom should be puddled, and concrete placed under the foundations of the walls. The Contractors contended that this variation discharged them from the contract and all penalties. But how it was hoped to sustain such a position, in view of the terms of the specification, it is difficult to apprehend.

It seems to us that exemption from responsibility to make, under any variation, a water-tight tank is distinctly negatived by this clause: "The Engineer shall have power to "vary the nature of the work, or to order any alterations or "omissions, and the same shall be performed by the con- "tractor; but *such variations shall not vitiate the contract*, but "shall be allowed for at the prices contained in the schedule, "or at such other prices as the Engineer may decide." Furthermore, under the general clause of the specification, it is provided that the work is to be done "to the satisfaction "of the Engineer, but *no alterations or corrections shall relieve* "*or release the contractor from his responsibility for the ultimate* "*soundness of the tank*, which shall not be considered com- "plete until it is proved to be water-tight to the satisfaction "of the Engineer." Under such very positive provisions as these, and bearing in mind that the change in the form of construction was the result of consultation between the parties, if the proposition had been upheld that the contractors were discharged from the contract and relieved of all responsibility as to the ultimate condition of the work, it would, in our view, have created a dangerous precedent, and one which would have given contractors a large measure of remission in what should be regarded as their fair risk and liability in connection with work executed under similar, and not uncommon, circumstances. There was no indication in the case that, when the change in the construction of the bottom of the tank was made, the Contractors sought to be, or suggested that they were, absolved from responsibility under the terms of the specification and contract; and it would appear that it was not until after they were unsuccessful in making the tank water-tight that the idea occurred that the change had acquitted them from all liability in the matter. We fail to see the use of making such provisions as those quoted, if they are to be so easily annulled as was assumed by the plaintiffs' case.

The expert witness for the Contractors was Sir George Livesey; and he regarded the departure from the specification in the matter of construction not merely as an alteration, but as a radical change, and held that it should be allowed for accordingly. We do not gather that the Company had any wish to do other than deal fairly with the Contractors, under the terms of the contract; but surely Sir George would not contend that the Contractors having proceeded with the work under the changed conditions, the obligations were not continued on their side—chief among which were the soundness of the tank, and the finishing of the work to the satisfaction of the Engineer. Messrs. Corbet Woodall and Son and Messrs. William A. Valon and Son were the engineering witnesses retained by the Company; and, for the interest which this matter possesses for all gas companies, it is almost a circumstance to be sincerely regretted that an agreement was arrived at before these experts had been under examination in Court. However, the settlement of the dispute provided that of £700 paid into Court, £500 should go to the plaintiffs and £200 to the defendants. In the early part of the proceedings, Justice Ridley indicated that he was impressed by the similarity of the case with that of *Thorne v. Corporation of London*, in which a Contractor agreed to build a bridge in a certain way that was found to be impossible. Another method had to be adopted, which cost considerably more than was originally contemplated; and it was held there that the Contractor was bound to pay the extra cost, as he had contracted to do the work. After the announcement of the terms arranged in the present case, his Lordship expressed the opinion that the case cited presented a difficulty in the plaintiffs' way, seeing that Lord Cairns had there held that a person must not take payment for an extra if he was going to say it was not an extra. Reviewing the whole circumstances, it seems to us that Messrs. Docwra and Son were undoubtedly well advised in agreeing to the settlement on the terms set forth, a little more fully than here, in our report of the proceedings; and, so far as the facts are presented, it is difficult to see that the change in construction in any way acquitted them from their bond in respect of the soundness of the final work.

The Parliamentary Session.

The King's speech with which the session of Parliament that has just ended was opened, was one of the shortest on record. The debates that have ensued have been some of the longest. That they have been of great interest to the general public is, however, open to much doubt, in spite of the endeavours of some of the newspapers to represent the country as being furiously concerned with the doings of its representatives. The public want to see the business of the country carried on in a business-like and efficient manner. For the long-winded orations of self-advertising politicians they care not a snap; and when these gentry raise plaintive cries because they are not permitted unlimited "freedom "of speech"—which really means freedom to express any shade of opinion, but not freedom to keep on talking about nothing in particular—the plain man says, "a good job too," and hopes that now they will proceed to do something.

The principal business done since Parliament assembled in the middle of January has been the passing of the London Water Bill—which has been sufficiently dealt with in the "Journal" during its somewhat leisurely progress from the first reading in January to the Royal Assent in December; an Act for the reform (by no means complete) of the Patent Laws; and the Education Act. Unfortunately, the debates on the last-named have been characterized by far more zeal on the part of religious sectarians than of those members who should take the greatest interest in education questions—namely, the members who represent the great business interests of the country. Co-ordinated, efficient education is the crying need of the nation, if she is to maintain her industrial prestige; but little was heard of that need in the House of Commons. It was drowned by the din of religious factionists. We are told that the new Act will do much in the future for education in the country. We hope

sincerely it will, though how it will work in practice it is really impossible to judge. It is to a large extent a "leap "in the dark;" and it will be no credit to the business men in the House of Commons if it prove as beneficial as its authors certainly intended it to be, and declare it will be. Some day, we suppose, it will be realized by employers—practically, and not merely in theory—that they want better educated servants. Then they will regret a lost opportunity for insisting upon that need being given first consideration when the educational system was being re-cast.

The only other features of the session of interest to us are the financial enactments. The income-tax, already so overloaded, was raised another 1d. (to 1s. 3d.) in the pound; a rather absurd increase in the stamp duty on cheques was proposed, but abandoned; the coal-tax was continued, and has not had a perceptible decreasing effect on the export trade; and the old registration duty of 1s. was re-imposed on imported grain and flour. The termination of the War in South Africa will enable some reduction in taxation to be made next April; and it is hoped that the income-tax will be materially abated. The end of the session witnessed an attempt by the Labour Members to raise the old cry of the sorrows of the "unemployed;" but the Government very rightly declined to commit themselves to action of any kind. They know those Labour Members.

Incandescent Mantle Combinations.

We have it on very good authority that thorium has found its way into a "corner," and that the producers of that essential of incandescent mantles will have, by their already effected combination, full control of the market at the end of running contracts. But that is not all. There is, it is understood, a movement quietly going forward for bringing about a combination of mantle manufacturers both in this country and Germany, in order to keep up prices. Further the story goes that the thorium combination are parties to this scheme, and that mantle makers who refuse to combine now will be, if the scheme is consummated, simply helpless at the end of the existing contracts for thorium, and will have to fall into line. All this has for its aim the rendering nugatory of the strenuous efforts that have been made to open the incandescent mantle business, in order that cheap mantles may be obtained. If the scheme is brought to a head, and it affects the prices of mantles, we think we may promise the prime movers and also their chief supporters a third combination, and that will be of the gas undertakings throughout the country to transfer their custom to those manufacturers who are compelled by the force of circumstances to join the coalition. The principal movers are known; and the gas undertakings of the country are strong enough to make them take a back-seat in the situation which they are trying to create. As a rule, trading combinations of this kind do not hang together long. Splits usually occur; but here there is a second party strong enough to keep the other together. Therefore, if the project comes to anything, all that can be done—in the absence of the discovery of fresh sources of thorium—is to submit, but not tamely. There will be trouble, in which those who have been busy starting and furthering the scheme will come out second-best. Let them examine well the part they are playing before they take another step. The gas industry has in years past been trifled with quite sufficiently in connection with incandescent mantle matters; and it is within its power to take, if further threatened, retaliatory measures.

Mr. Carter's Rating Statistics.

The Borough Treasurer of Preston, Mr. James Carter, has continued for another year his statistical labours in the domain of municipal finance and industry. He has once more prepared a tabular statement exhibiting the rates that are "levied and collected"—the distinction strikes one as minute—in various towns; and also showing the local charges for gas, electricity, and water. It is an instructive table in its way, and doubtless the preparation of it is very much of a labour of love with Mr. Carter. Precisely what it is designed to prove, however, is not easy to surmise. There is, at any rate, one column in the statement which seems likely to mislead as much as to instruct. This is the column in which the figures show "the amount in the "pound by which the rates have been reduced in consequence "of rents of property and profits transferred from gas, water, "markets, &c." It might have been expressed differently. We noticed Mr. Carter's table exactly a year ago; when we drew attention to the futility of separating rating from assessment, if one desires to know how localities compare with one another. But there is another point. We observe that some organs of Progressive Municipalism have gladly pounced upon Mr. Carter's figures, and quote them as proof of the advantage that is derivable from municipal trading. If such a use is to be made of the statement, it is right that the objection should be taken that the figures do not bear the construction put upon them; and, in addition, they are very far from being either complete or always correct. Neither Birmingham nor Sheffield is included; and only the one Metropolitan Borough of Islington, which is credited with carrying on profitable trade to the value of more than 3d. in the pound! This is a borough with no gas or water undertaking of its own, and an electricity supply undertaking which its best friends do not dare call solvent. On the other hand, West Bromwich, with its own gas supply strictly modelled on the Birmingham pattern, is not credited with a farthing for it. The truth is that the several rate funds and charges vary so widely in different places that it is practically impossible to compare one with another to any useful purpose. One can see at a glance that West Ham at 10s. 2d. in the pound is easily first in the competition for the highest rating; but it is not so easy to pick out the lowest rate. The differences of rateable value per head of population are enormous also. Here are such places as Gateshead and East Ham, with a valuation of little over £3 per head of the inhabitants, classified with such examples as Blackpool, worth nearly £10 per head. Comparative statements such as this are very good, so long as they are not used to make comparisons.

A Suggestion for Preventing Electrolysis.

Another suggestion for the prevention of the electrolysis of gas-mains has been made by Captain William Brophy, of Boston, Massachusetts, in a paper read before a Firemen's Convention. There is no difficulty in apprehending the nature of the interest which this kind of mischief inspires in the fireman's breast. Twenty or thirty years ago, in the United States as elsewhere, when water or gas mains had been properly laid in the ground, there they remained fit for service and free from any troublesome amount of leakage for any length of time. If the fireman wanted the water and did not want the gas, he was not likely to find too little of the one and too much of the other. Now, this is precisely what he does find, wherever the overhead trolley tramway system goes; and it goes everywhere in the United States. If it is not yet possible to travel from Chicago to New Orleans by electric cars, it soon will be. In the meantime, the great god Slapdash, whom most Americans worship, is ministered unto by layers of tramway lines, who do not think it worth while to do very much in the way of rail bonding. Coal is cheaper. It is less troublesome to let the return current get home any way it likes than to try to keep it to the rails. Speaking of the common practice of connecting the negative side of the dynamo with the buried pipes, Captain Brophy remarks that this would be an excellent plan if only the mains had no joints; but it is in passing the joints that electricity sets up corrosion. In the city of Wheeling, West Virginia, the tests showed that there was a flow of 300 amperes from the pipe to the rail. What was done was to take out one length of the main, and replace it with a non-conducting pipe to break the circuit. The result was a complete cure. At once corrosion of the joints ceased. There is no difficulty in getting stoneware drain-pipes to match all but the very largest gas-mains; and Captain Brophy strongly recommends that this expedient should be used as an additional precaution, the best prevention being, of course, making the best quality of track.

Representation of Trading Companies in Colonial Governments.

A parliamentary paper just issued by the Colonial Office may perhaps be taken as an indication of the way the wind is blowing in respect to the reform of local taxation. It consists of a circular-letter addressed by the Secretary of State for the Colonies to the Governors of all Colonies under responsible government, stating that a return will be moved for in the next session relating to the parliamentary,

municipal, and local representation of trading companies in the Colonies. Ministers are asked to furnish answers to certain questions so far as their own government is concerned, in order that the Colonial Office may be in possession of the information requisite for the expeditious preparation of such a return. These questions relate in the first place to the parliamentary franchise, and are directed to ascertain whether joint-stock trading companies have any part in the parliamentary representation; whether the manager, or secretary, or directors of companies have any such representation, by virtue of the rating of the concern or otherwise; and whether the answer applies to representation on local bodies. The Commonwealth of Australia has alone answered the questions, in the general sense that the only suffrage known in Federal Australia is that enacted in the present year, which is adult suffrage for all natural-born or naturalized subjects of the King who are not otherwise disqualified. This reply is quite beside the mark, and is admittedly only provisional, as it is announced that the various State Governments will deal fully with the question of representation in their parliaments and municipal bodies. It remains to be seen what further answers Mr. Chamberlain's circular of inquiry will evoke; but one somehow has the impression that the information so obtained will be of a negative character. The difficulty under which joint-stock companies in England labour in regard to rating without representation on the rating authority does not yet oppress their Colonial analogues. Indeed, it may be doubted if there exists anywhere in the universe a state of things in regard to local government finance at all similar to the English. From whatsoever cause this singularity of experience proceeds, it will require to be carefully gone into when the question of local taxation reform again engages the attention of Parliament. This being so, the next question which suggests itself is, What is the remedy? Is there any expedient upon which property owners can agree, whereby the disability of joint-stock companies might be removed? If there is, it would be well to know of it betimes.

An American's View of Municipalism.

At the present time, when so much is heard in England concerning the beauties and glories of Municipalism, it is refreshing to be reminded that municipal virtue, like another thing discussed by the Pompadour, is very much "a matter "of latitude." It is curious how outspoken prominent Americans are respecting their experiences in government. Politics the average business American does not care very much about. He has so much of it. But what he knows in the way of Municipalism excites his liveliest horror. Now, why should this be? Some of our arm-chair democrats might be asked to explain. Mr. Waddell is a leading American Civil Engineer, who recently addressed the graduates of the Rose Polytechnic Institute. In the course of a swift review of the several main specialities to which an engineer can apply himself, Mr. Waddell mentioned municipal work, only to declare that he would prefer a ganger's job on a tip (in the original this reads "boss grader on a "dump") to that of a city engineer, and would rather work as a navvy with pick and shovel than accept a subordinate position in the engineering department of a city. This is odd. Our contemporary the "Engineering Record" regards it as deplorable that such things should be spoken of a branch of professional work which improves in character every day. Still, it has been pretty bad, or we should not have Mr. Waddell going on to declare that "it degrades "a man, in his own estimation at least, to feel that he is "at the mercy of every log-rolling, wire-pulling, ward poli-"tician who may for any reason take offence against him." The "Record" naively remarks on this that many of the class of politicians of whom Mr. Waddell was thinking are really good fellows. But it goes on to admit that in the United States the way of municipal life is made hard, even for men of the highest character, by the savage criticism with which their every action is met. Judgments upon politicians are delivered in terms which a reputable judge would not use to a convicted criminal. If this is the case, it is no wonder that municipal work of any kind has come to have a bad name in the country. It is nevertheless remarkable that Municipalism in the United States should have fallen so low in public esteem, whether deservedly or not. Evidently, the efficacy of the system depends upon the way in which it is worked and the men who work it.

The Institution of Gas Engineers.

Although they have applied themselves loyally and assiduously to the work connected with the bringing about of the amalgamation of the Institute and the Institution, there is little doubt that the members of the Council of the united body will be heartily glad when the whole of the work entrusted to them is accomplished. It has claimed, and is still claiming, a large amount of time and responsible labour. Besides correspondence, each occasion a meeting is called, it means the bringing of the members from all parts of the country, and, in several cases, long journeys and a night from home are necessary Since last June, there must have been at least half-a-dozen meetings of the Joint Councils (now the Council); and these over and above the ordinary claims of other Association engagements, must have been a heavy tax on the time of several of them. But it has all been cheerfully borne for the sake of unity. In the middle of last week, we believe the Sub-Committee who were appointed by the Council to deal with applications in their initial stage were in London on this special business; and on Saturday the full Council were meeting. Just now work at home is at its full height; but the summons was willingly responded to. Truly, the Council will have earned the heartiest acknowledgment of the general body of members by the time the statutory meeting of the Institution is held.

The "Selas" Incandescent Gas System.

Those of our readers who attended Professor Lewes's third Cantor Lecture, or who have read the report of it given in the last number of the "Journal," will remember the reference he made to the above-named system, some results obtained with which he quoted on the authority of Mr. F. D. Marshall, of Copenhagen. Professor Lewes expressed the hope that Mr. Marshall would be able to read a paper on the system, and give a demonstration of its capabilities, at the next meeting of the Institution of Gas Engineers; and we understand that this is his intention. In the meantime, he has been good enough to send a few particulars for publication. The mantles used are very small—no larger than an elongated thimble; yet, by means of the method of mixing the air and gas with which they are supplied, it is possible to get with them an illuminating power of 38 English candles per cubic foot, or as much as 45 candles per foot with high-pressure gas. There is nothing special, in either the mantle or the burner, that enables such excellent results to be obtained. The whole secret lies in the aëro-gaseous mixture used; and the vehicles employed for its utilization in the production of light are so small because they are found to give the best results. Mr. Marshall is about to exploit the invention in England; the patents for this country and America being vested in him. The system is making great strides upon the Continent, and is working very satisfactorily in Berlin, Copenhagen, and Stockholm; and we learn from Mr. Marshall that a start will soon be made with it in Zurich. With his habitual courtesy, he has expressed his willingness to show the process in practical operation to anyone who does not mind undertaking the journey to either the Prussian or the Danish capital; and he has even offered to send over, for private information, the drawings and descriptions of the apparatus. The journey, however, will scarcely be necessary, for Sir George Livesey and Mr. Carpenter have taken so much interest in the system that they will afford Mr. Marshall an opportunity of showing his light at the Old Kent Road station of the South Metropolitan Gas Company, when his English colleagues next foregather in the Metropolis. We feel quite safe in assuring Mr. Marshall that the opportunity will not be lost.

Hints on the Choice of Gas-Fires.

Considering the long period during which the advantages of gas as a heating agent have been recognized, it seems rather remarkable that any advice should be needed in regard to the selection and fixing of suitable appliances for its proper utilization. But when evidence of this need is furnished by so competent an authority as Mr. Thomas Fletcher, it should, we think, be accepted without question, and receive due consideration. It is for this reason that we direct our readers' attention to the article contributed by him which appears in another column. He shows therein how consumers, and especially medical men and their assistants, the professional nurses, become prejudiced against

the use of gas-stoves, not from any defects in these appliances, but because they have been employed under improper conditions. Unfortunately, Mr. Fletcher has been more or less an invalid for some years; yet his misfortune has given him unusual opportunities for studying various systems of heating sick-rooms, and he has turned them to good account. He tells us in his article how, by going the right way to work, the prejudices above alluded to may be overcome, and converts secured. In his own case, the medical attendants, who had been in the habit of ordering gas-fires out of sick-rooms, were actually led to adopt them in their own homes; while the nurse came to be strongly in favour of them. It will be seen that Mr. Fletcher is an advocate of radiant heat, without which, he says, it is impossible to keep the floor and feet warm. We need not deal here with the various points urged by him in advocacy of the use of gas-fires; but will leave them to the consideration of our readers.

The Professional Witness.

Expert witnesses are sometimes compelled to hear and read hard things about themselves, particularly when the evidence offered by those appearing for different parties in the same case happens to be more than usually difficult to reconcile. Though a well-known definition has it that persons giving expert evidence "are, in fact, a sort of assistants to the Judge," the Judges themselves (as they have on occasion most unmistakably shown) are unfortunately not always able to regard them in this useful light; and while it may be admitted that the instances in which the definition quoted does not hold good are the exception, it must at the same time be urged that they should never occur. But it should in fairness be remembered that the questions on which expert witnesses are called to give evidence are, as a general rule, very largely matters of opinion, and therefore depend to a considerable extent upon the point of view from which they are looked at. A professional witness has to consider his client's interests; and it is his duty, of course, to make out the best case he can for him. At the same time, however, he owes a duty to the tribunal before which he appears, and, more important still, he owes a duty to himself. The expert witness takes so prominent a part in matters in which the "JOURNAL," as a technical publication, is interested, that his honour is necessarily dear to us; and we much prefer to hear of his commendation than of his condemnation. The perusal of a paper read last week, before the Auctioneers' Institute, by Mr. Walter D. Hollis, in defence of surveyors and valuers, has therefore been a pleasure—more especially as the remarks made by the author apply, if not equally, at any rate in large measure, to engineers. Referring to arbitrations, which are notorious for conflicting statements and figures, Mr. Hollis points out a fact which is too often lost sight of—namely, that the cases brought before the umpire are the exception, the vast majority being settled amicably; while of those in regard to which no agreement is arrived at, by far the greater number present difficulties giving scope for a wide divergence of opinion among the most experienced of men as to the method or theory which should be adopted in fixing values.

Only Human.

The professional witness, argues Mr. Hollis, cannot, in the consideration of his client's interests, divest himself of one of the most powerful influences in the world—the influence of bias. The professional career of the valuer is one long lesson in bias. He is trained to it from the very beginning—bias in favour of his clients. Naturally, therefore, in considering a case and preparing his evidence, he concentrates his mind upon his client's interests; and all his ideas and desires for the time being trend in that direction. Mr. Hollis even goes so far as to say that he has known instances where bias has gained such influence over a witness that he has positively believed his client's claim, as formulated and presented by himself, to be absolutely unanswerable, and has resented with righteous indignation the views of the other side. Whether or not such a perfect belief as this by an expert in the correctness of his own views of a case is properly expressed by the term "bias," we must candidly confess that this is the sort of witness we should like very much to have on our side in a legal action or an arbitration. Touching upon the monetary aspect of the subject, Mr. Hollis remarks that the professional witness is human, and therefore cannot expect to escape temptation. There are avaricious clients and over-zealous advisers; and there is thus a feverish demand for extreme figures. The conscience of the witness is of no consequence whatever; that is his look-out. As Mr. Hollis truly points out, however, this matter of figures is entirely in witnesses' own hands; and if, as individual members of a profession, they plant their feet firmly and resolutely down within the limits of their convictions, as a matter of principle their clients will not suffer, the example will not be lost upon those who are to follow, and they will uphold the dignity and honour of their profession. This is not an ideal impossible of attainment; it is no more than Judges, umpires, and the public generally have a right to expect. Many—nay, most—already act up to it; and those who do not, will be well advised to take earnestly to heart what is here said. Mr. Hollis concludes his paper with a dictum of the Lord Chancellor, intended as a suggestion to the Bar, but which might also with advantage be borne in mind by professional witnesses. It is short, but to the point: "Wherever you exaggerate, you weaken."

A Mixture of Gas and Water.

Gas managers have troubles enough to contend with in the ordinary course of their business, especially in the winter time, without being the victims of such an experience as has fallen to the lot of Mr. Ritson so soon after his removal to Ramsgate. The story of this experience, as unfolded before the Magistrates during a hearing which lasted five-and-a-half hours, is indeed an extraordinary one; and it is difficult to understand how any man in his right mind could have behaved as the defendant is alleged to have done. As notice of appeal has been given, the case cannot be regarded as definitely settled yet; and it is to be hoped at a later stage the defendant may be able to prove that he is innocent of the charge on which the Magistrates have found him guilty. According to the prosecution, the gas and water pipes in an empty house were deliberately connected together, with the result that a large amount of water found its way into the gas-pipes, and caused damage to meters, &c., amounting to £50. It was alleged that this was done out of spite; the defendant having recently been convicted of having infringed the building bye-laws. But he maintained, on the contrary, that the present charge was the result of ill-feeling on the part of the Corporation towards him, as he had often criticized their doings. It would not be fair, in view of the possible appeal, for us to express any opinion as to which, if either, of these contentions is correct; but the facts of the case are reported elsewhere, so that readers can form their own ideas on the subject. The proceedings were brought under the Gas-Works Clauses Act, 1871, which provides for wilfully damaging meters a maximum fine of £5, and the payment of the damage caused; and the Magistrates, after taking ample time to consider the matter, ordered the defendant to pay the fine named, as well as the damage claimed, and costs—the total amount being close upon £60. The Chairman stated that the Bench felt bound to impose the full penalty, in view of the serious danger to life which might have ensued if an explosion had taken place as the result of defendant's conduct. This danger to life appears never to present itself to persons who tamper with the gas supply; but that it is a very real one, is shown by the accidents which so frequently arise from the unlawful connecting and disconnecting of gas pipes and fittings. After reading the case, it is impossible not to agree with defendant's solicitor, who is reported to have said that "a man who would deliberately do a thing like this, who would injure people against whom he owed no grudge, deserved no consideration from anyone."

The Crystal Palace Heating and Smoke Abatement Exhibition.—One or two additional stands have been added to the "exhibition;" but even now, we understand, it is incomplete, and will not arrive at that desirable stage for a few days. With reference to the remarks which appeared in the "JOURNAL" on the subject last week, the "Organizing Commissioner" informs us that he did drop the proposed gas section, and devoted himself mainly to the heating and smoke abatement sections. There are one or two stands showing gas-heating arrangements; but they are not occupied by the recognized large makers of such appliances. We are asked to state—"to prevent misunderstanding"—that the Mr. Hersey whose name has been mentioned in connection with the exhibition, is not Mr. Sidney Hersey, of the firm of Kirkham, Hulett, and Chandler, of Palace Chambers, S.W.

WATER AFFAIRS.

The London Water Bill Passed.

THE final stage in the progress of the London Water Bill through Parliament was reached last Thursday, when the unusually long session closed; and the measure received the Royal Assent, and thus became a part of the law of the land. The quaint old-time language of another nation in which His Majesty, speaking through his Commissioners, expressed his will that the scheme for dealing with the Metropolitan Water Supply which had been promised in the Speech from the Throne at the opening of the session should be placed upon the Statute-book of the realm, set at rest—at all events for a time—a question which has been more or less a cause of controversy for half a century, and terminated the separate existence of a group of Companies whose management has been more severely criticized than that of any other commercial undertakings, with perhaps the single exception of those engaged in the supply of gas, in London. The control of these undertakings will, in a short time, pass into the hands of a "Water Board;" and then the public, who have been led by clamorous agitators to believe that they have been the victims of the tyranny and oppression of a set of grasping capitalists, will have an opportunity of judging whether they will fare very much better at the hands of a body composed of their own representatives. If they do not, the blame will rest with those who have persistently depreciated the existing management, and studiously blinded the eyes of the public to the advantages they have derived under it. It was in vain that Royal Commissions and official inquiries brought out abundant testimony to the efficient manner in which the water supply of the Metropolis was being conducted by the Directors of the Companies and their able engineering staff. This testimony was not only ignored, but the resources of vituperative language were exhausted in the abuse of those who had given it. It may now be safely assumed that all such language will be unheard in the future.

Now that the fiat has gone forth that the Companies are to part with their undertakings, it will be a source of gratification to all who are connected with them to reflect that they were never in better condition for meeting the demands upon them than they are now. Sir Henry Knight told the shareholders of the Southwark and Vauxhall Water Company a few days ago that when the works now in hand are completed, they will be adequately equipped for the next forty years. Three of the Companies are concerned in the great Staines reservoirs scheme, which will shortly be ready to store some 3300 million gallons of water for the use of the Metropolis. In the East, storage is being increased; and in the West, the Chelsea Company have an unused drawing power upon the Thames to the extent of nearly 10 million gallons a day. Furthermore, the distributing systems of the Companies have now been so linked up that one can help another, and thus avoid interruption of the constant supply of water in the poorer districts of London which had to be resorted to so regretfully three or four years ago, owing to the extraordinary meteorological conditions then prevailing. And when we speak of constant supply, we are referring to an inestimable boon which the Companies, of their own motion, have gradually extended of late years until it is now practically general. So far as the individual consumer is concerned, he received every day, for his domestic use, in the year ending Dec. 31, 1901, an average of about 26½ gallons of water, or 34½ gallons including all purposes. Certainly, he has not a great deal to complain about on the score of quantity; nor do we think he can find much fault with quality or price.

All things considered, therefore, the Directors of the London Water Companies need not fear to submit their undertakings to the scrutiny of the Arbitrators when the time comes for appraising their value. Notwithstanding all that their detractors say, they are worth something more than the "old iron" price which many would like to pay for them. They represent works on which a sum of about £20,000,000 has been expended on the faith of legislative sanction. Those who have had the responsibility of spending this money have never been proved guilty of acting recklessly, but have steadily—and sometimes in the face of persistent obstruction—made their works equal to the ever-increasing demands upon them caused by a growing population. The owners of these valuable undertakings are now parting with them under compulsion; and as they have been denied the right which every unwilling seller can claim in determining the worth of his property to the buyer, we trust they may receive at the hands of the Arbitrators appointed under the new Act such fair and reasonable compensation as we consider they are fully justified in claiming on the transfer.

Water Softening.

IT was a practical paper that Mr. T. Molyneux read at the recent meeting of the British Association of Water-Works Engineers, on the question of the softening plant at the Wilmslow station of the Stockport Corporation Water-Works, of which he is the Engineer. To the best of our recollection, this is the first time that the subject of the softening of water has been specially dealt with at a meeting of the Association; but, the paper being restricted to a description of the system adopted at the works named, the consideration of the general question by the members on this occasion was likewise somewhat limited. The older, and admittedly crude, systems of water softening have been greatly improved of late years; and the process which Mr. Molyneux has adopted—the Archbutt-Deeley—is one of the best of the competitors. It would now be instructive, and of very considerable interest, if an engineer or engineers having works of somewhat comparative output and with experience of the various systems, would bring them under the critical examination of a meeting of the Association, and then a more profitable discussion than that which ensued on Mr. Molyneux's paper would, we fancy, result. An important absentee from the meeting while the softening of water was under discussion was Mr. William Matthews, who has the Atkins system, as simplified by himself, in operation at the Otterbourne water-works of the Southampton Corporation. Had he been present, he would have given the discussion a more general turn; and some valuable facts from actual working might have been elicited on which comparisons could have been founded—of course, taking into consideration the differences in size between the station at Stockport dealt with by Mr. Molyneux and the Otterbourne works.

Without the author's explanation, and taking his figures alone, one might pardonably be a little surprised as to why he went to the trouble and expense of softening this water at all. In point of hardness, either temporary or permanent, the water in question is only of a degree to which softening would be carried in most other places. Regarded only from this point of view, the adoption of a softening plant was merely a concession to the fancy of the residents in the particular district supplied from these works for a very soft water, and to rid the Corporation of an undesirable opposition at the time the Water-Works Purchase Bill was in Parliament. If the palliation of the already low hardness had been the only want, it might have been a question whether the satisfying of the District Councils by putting a perpetual burden on the undertaking for the one and really unnecessary purpose was justified. But there was another trouble with this particular water supply, which the Corporation were bound to remedy as a matter of duty. The water was affected by iron; and the Archbutt-Deeley system was chosen by Mr. Molyneux and his Committee as the best method, under the particular circumstances of the case (as explained in the author's reply on the discussion), to deal with the trouble. It is successful in clarifying the water; and so the author succeeded, as it were, in "killing "two birds with one stone." While it was necessary to treat the water for the one purpose, he met, by the system applied, the requirements of the district in a second, but less important, particular. To do this is good engineering and management.

Carbonization of Wood.—In a wood-carbonizing process for which M. Mourlot has taken out a French patent, the wood is introduced into a retort, to which heat is applied for 12 hours; the distillation products being conducted through a pipe to a condenser for subsequent collection and treatment. The gas may be delivered through a pipe into the fire-box, and employed for heating the retort. The novelty of the system rests on the fact that the heat is to be so gradually raised that, before destructive distillation commences, essential oils, &c., natural to the wood, may be recovered.

ESSAYS AND REVIEWS.

BOLLING AND LOWE ON TRADE PROSPECTS.

We have been favoured with an "advance proof" of the annual review of the year's trade published by Messrs. Bolling and Lowe. This review lays stress on the fact to which attention was early called in these columns—the great and growing influence exercised by the condition of trade in the United States upon the welfare of this country. The history of the past twelve months, so far as the iron and steel trades in Great Britain have been concerned, has been dominated by the abounding prosperity of these industries in the States. This has meant the concentration of output on the home market, which has even then not been satisfied; and, consequently, very heavy shipments of material have been sent from Europe, not only to the United States but also to South America and Mexico. The exports of pig iron, steel rails, slabs, blooms, and billets have run into hundreds of thousands of tons—a striking contrast to the state of things about three years ago, when the States were pouring their surplus of these articles into this country and competing with us in foreign markets, thereby materially assisting in bringing the "boom" to an end. As is remarked by Messrs. Bolling and Lowe, these changes and fluctuations are very disturbing and difficult to cope with; and it behoves the manufacturer, and the merchant—and the consumer—to be constantly on the watch for them. It is one of the aims of the "Journal" to keep readers as fully and as promptly informed of the movements of trade, and their probable effect, as a constant and vigilant observation of all available sources of information renders possible; and no one knows better than we do how complex is the study.

The termination of the South African War was another important circumstance in the past year's trade; but the probable effects of that event were sadly miscalculated in some quarters—an immediate and appreciable revival of trade being anticipated. Those who counted on such a revival forgot, first, that the earliest result would be the stoppage of all the trade activity caused by the war—no small matter; second, that a country that has been harried by war for close upon three years cannot be expected to settle down into full industrial activity within a few weeks of the declaration of peace; and, third, that the drain of three years' war taxes must have a slowing-down effect upon the trade of the country that has to pay them. There will, doubtless, be an increase of exports to South Africa, and an increase in her shipments of gold to us, as time goes on; but the growth of trade will be a much more gradual affair than some people anticipated.

Moreover, it must not be forgotten that Germany is badly off for business at the present time, and will do her level-best to get a share of the orders from the Transvaal and Orange River Colonies. In the review before us, it is pointed out that the consumption of iron per head of the population in Germany has fallen from 132 kilogrammes in 1900, to 89 kilogrammes in 1901, and to only 67 kilogrammes this year. The exports this year show a large increase over last year; but as a great deal of the iron was sold in our markets at a very low price in order to realize stocks, the Germans are very anxious still to find business—and they are not slothful in running after it. Russia also is suffering severely from trade depression; not half her iron furnaces being at work. The means of production have far outstripped the regular consumption; and there is no prospect of any great extension of the demand. Austria-Hungary is no better off. Thus the year's record for the Continent of Europe is anything but a cheerful one. On the other hand, trade in South America—and particularly in Argentina, Brazil, and Chili—has been satisfactory on the whole, and Japan continues to be a good customer for iron and steel. As her navy is to be increased, the shipbuilders in this country may hope for more orders. They can do with them. At present, the prospect in their industry is truly described as being "far from cheerful."

The production of pig-iron in this country this year is estimated at 8 million tons (slightly more than in 1901), as compared with about 17½ million tons in the States, and 9 million tons in Germany. One of the curious features of the present situation is the smallness of our stocks of iron. Messrs. Bolling and Lowe remark that upon turning to their report for 1872-3 (when the great "boom," caused by a heavy demand from America, was in progress) the stock in Connal's Stores, Glasgow, stood at 106,919 tons with the price of iron at 119s. per ton; whereas now the stock stands at under 26,000 tons, and the price at 54s. 9d. Then, steel rails were quoted at £17 per ton; to-day, the quotation is £5 5s. No stronger proof could be adduced of the weakness of trade in this country at the present time. Any big revival in the near future would—in the existing condition of stocks—create some uneasiness; but the margin of idle plant that could be brought into work in a short time removes danger from the situation. Not many furnaces were out of blast in 1872-3.

The best employed branch of the iron and steel industries during the past year has certainly been that engaged in the manufacture of rolling stock and permanent way; and it is likely to remain fairly well employed for some time to come. Pressure for delivery has been at times so great that some Indian Railways had to go abroad for supplies; but as the Continental works were late in delivery, they did not gain much in point of time. It is remarked that steel cars, "which are easily handled and cost little in repairs," have not come into general use in this country. That, however, could hardly be expected to take place except as a gradual change; our railways being already burdened with heavy capital accounts, and not being constantly and rapidly growing, in regard both to mileage and traffic per mile, as is the case in America.

Reference is naturally made to the growth of the huge Trusts in the United States. Those incorporated this year have a capital of about £114,000,000; and before long the production of every article of consumption will be regulated by them—a fact which is viewed with no little apprehension. Moreover, the question of how these mammoth concerns, with their heavily watered capital accounts, are to pay dividends unless the consumers—which will soon mean the entire population—consent to be fleeced year in, year out, is considerably exercising the minds of the far-seeing financiers and business men both in America and here.

For the present, the trade outlook in the States is excellent; here, only very moderate, and depending largely upon the progress of events across the Ocean. The end of the "boom" in America (and it should be noted that, while the demand for iron and steel still continues very heavy, there are signs of over-production in some of the higher branches of the finished goods trade) will produce a situation fraught with great anxiety, to say the least, for the British manufacturer.

ELECTRIC LIGHTING MEMORANDA.

A Surcharge at Watford—Telephones of Tunbridge Wells—The Precedent—How Electric Lighting can Compete with Gas in St. Pancras.

A good example of what passes for Government control of local authorities is furnished in regard to the electric lighting of Watford, and is duly noticed for the edification of other authorities similarly situated, by the "Electrician." Our contemporary remarks that instances of the surcharging of members of town councils by the Local Government Board in respect of expenditure incurred on electric lighting are rare; and this particular case is a hard one. It appears that at Watford the electric light has been supplied in certain new streets which have been added to the district since the date of the Council's Provisional Order; and they are therefore not included within the specified area. It has been ruled by the higher powers that the expenditure of capital on the lighting of these streets is illegal, and the maintenance of the lights is illegal also. Hence the whole amount involved—£110—has been surcharged upon the members of the Council. We cannot, of course, offer an opinion upon the local bearings of this affair. It is quite possible that the objection was raised in order to keep the Council from going further afield in search of that remunerative connection which always seems to retreat as it is approached. The circumstance in itself is noticeable as indicating an essential difference between statutory gas supply and electricity supply by Provisional Order. It is no wrong to supply gas without parliamentary powers. If it were, a good many unsuspecting offenders would be disagreeably surprised. If the ruling in the Watford case is correct—as it must be assumed to be—it will be necessary for those concerned to look sharply after Electric Lighting Orders elsewhere.

The precedent of the sale of the telephone undertaking of the Tunbridge Wells Corporation to the National Telephone Company continues to exercise the minds of municipal politicians and others, as well it may, for many reasons. Efforts were made down to the last, by outsiders, to induce the Postmaster-General to refuse his consent to the transfer; and it may be taken for granted that if the undertaking had been an electric tramway, or electric lighting, instead of a telephone service, the fuss made over it would have been even greater. The powers of the Postmaster-General in the matter, as Mr. Austen Chamberlain was careful to point out to those who prayed him to overrule the decision of the Corporation, are not of this kind. All he is concerned with is the terms of the respective licences. The Company's licence is not in the same terms as the municipal licence, and is not of the same date. The important questions for the Postmaster-General to decide, therefore, were as to what powers went with the property to be transferred. Should the expiration of the Company's licence be put forward to that of the newer municipal licence, and should the obligation to make telephonic connection on demand (which applies to municipal but not to company telephony) be extended to the Company in this instance? According to the actual decision, the transfer is of the material undertaking by sale, not of the municipal licence. The distinction is of the first magnitude, as anyone can perceive. Furthermore, the transfer is to be attended with certain conditions. The Corporation engage not to compete any more, which is tantamount to giving a goodwill. In return, the Company accept the obligation not to show preference to any subscriber. Their licence is not prolonged; but they are placed on somewhat better terms

in regard to the event of purchase by the Postmaster-General at the termination of their period.

It will be noticed here that the essential difference between a telephone licence and an Electric Lighting Order is that a company's telephone licence does not contain any obligation to supply on demand. This is because it does not give any compulsory power for laying or carrying wires. Way-leaves have to be procured by agreement; and it would be an inconsistency to impose obligation without granting the means of fulfilling it. The broad result of all this is that a municipal service has been sold outright to a trading company for its structural value, just like any other class of property, which is a steadying reflection for municipalizers. Hitherto the order of transfers of such property has been in the contrary direction. Electricity supply undertakings have been purchased by local authorities, not sold by them; but the course of these transactions is quite likely to take a turn in the near future. When the business starts, there will be some remarkable exercises in valuation; and local authorities will be lucky who obtain such good terms as the Tunbridge Wells Corporation have secured from the National Telephone Company.

An illustration of what a local authority having their own electricity supply understand by competition with a gas company occurs in St. Pancras, where an offer of the Gaslight and Coke Company to modernize the public street lamps and fit them with incandescent gas-burners was submitted to the judgment of the Borough Electrical Engineer. Naturally, he advised that every street having a distributing main in it should be lit by electricity, relegating gas to only those streets where such mains are not likely to be laid. But this would not settle the difficulty of the Borough Council, because the gas-lit streets would still be much more cheaply served in this respect than the electrically-lit thoroughfares; and comparisons odious to the municipal traders would continue to be drawn. Wherefore, the Borough Electrical Engineer remarks in his report that it is idle to make pretence (as is done in the advertisements of the Borough Electricity Department) that electricity is cheaper than gas, when every time the question of extending the electrical street lighting is raised, the price is unmistakeably higher than the Gas Company's charge. It is further submitted "that it is not desirable for the Council, as owners of the electricity undertaking, to pay from the rates towards supporting a competing Company and advertise their wares along routes covered by the distributing mains. By sacrificing profits, the streets might be lighted to three times the brilliancy by electricity than by incandescent gas at practically the same or less cost." We should like to see it done.

THE GAS AND WATER STOCK MARKET.

(For Stock and Share List, see p. 1705.)

At last a turn for the better has come to the Stock Exchange It would not be prudent to count too much upon it; for it is pretty sure to give way to the profit-snatching process, which will set the pendulum swinging the other way. But anyhow, there it was, and some people even felt grateful. Almost every department last week was brighter and more cheerful, though it would be hard to say why in some cases, and prices advanced all along the list. The public, too, seem a little less shy; and if the rise can only be maintained awhile, they will be flocking in. They generally do, after prices have risen. In the Money Market, the position was rather easy at the opening. But a strong and increasing demand rapidly set in; and on Friday the Bank of England had to raise its rate for short loans (not its discount rate) to 4½ per cent. Business in the Gas Market was perhaps a shade brisker than it was in the previous week; but it only made a moderate total even then. The general tendency was steady, hardly any change taking place in quotations. In fact, in the London market, there were only two variations—one up and one down; and each of them was only of the magnitude of a single point. In Gaslight issues, there were some moderate transactions daily in the ordinary at very steady figures, though at the close perhaps the tendency was not quite the best of the week. Among the secured issues, the debenture was the strongest, while the maximum fell back a point. South Metropolitan was a little more active, and was disposed to be firmer; and the closing mark, 118⅓, was the best of the week. The debenture was in some demand, and advanced a point. There was nothing marked in Commercials. Dealings in the Suburban and Provincial group were rather more plentiful than they have been for some time past; but they gave rise to no movement. In the Local Exchange, Sheffield "C" was a point easier. The Continental Companies were very inactive, without a single transaction in either Union or European, and with less than half-a-dozen in Imperial. None of the undertakings in the remoter parts of the earth made any sign. In the Water Companies, the feature of the week was the profit-snatching that supervened after the late sharp advance. At first, the tendency was firm; but it soon gave way, with the result of a reduction in some quotations, as noted below.

The daily operations were too even and uneventful for further detailed notice. The changes were: On Monday, Southwark Water rose 2. On Wednesday, Gaslight maximum fell 1; but South Metropolitan debenture gained 1. Southwark lost its rise of 2. On Thursday, Chelsea and East London relapsed 5 each. On Friday, Grand Junction fell 2; and on Saturday, Southwark 2.

THE PHYSICS OF FAN VENTILATION, AND HIGH PRESSURE GAS DISTRIBUTION.

In the concluding sentences of our second notice of the report of the Departmental Committee of the Home Office on the Ventilation of Factories and Workshops, passing mention was made of the fact of the work of fans in moving air mechanically being included in the Committee's survey. This matter is so important, in all its bearings, and appears to be so little understood, that it is very well worth while to ask the attention of engineering readers of the "Journal" to the contribution of the Committee to the science of the subject. It is scarcely necessary to lay stress upon the wide range of the engineering of fans, blowers, exhausters, and air and gas pumps. Apart from the technic of ventilation, there is scarcely a great manufacturing industry which does not make use in some way of appliances for compelling and assisting the movement of air or gas currents. Yet these particular operations are so highly specialized as a rule, and the manner in which they are carried out in order to secure the object sought has usually been arrived at so exclusively by practice only, that the theories and principles of the subject have been largely left in a twilight of vagueness and uncertainty. From this it has followed that there is considerable difficulty in the way of the exchange of knowledge concerning this branch of engineering. The practice of gas-exhausters, for example, has grown up alongside of, but perfectly disconnected from, the practice of air-blowers in iron manufacture. Quite recently, the developments of pumping gas at high pressure through mains, and of assisting the conveying capacity of gas-mains by the introduction of "booster" fans, have been made entirely for practical reasons and without much, if any, reference to principles. We venture to declare that this is not to the credit of scientific gas engineering. A request has, more than once, been preferred in these columns for something like an exact statement of the physics of these practical expedients of gas engineers; but nothing of the kind has been forthcoming. In return, we have committed ourselves to the declared judgment that the value of the developments in question is limited, and that the advantages claimed for some of them at any rate are illusory. This is the weakness of all these rule-o'-thumb expedients. It is not sufficient to defend them on the ground that they answer the particular purpose intended. Of course they do, on the face of things, or they would not be practised at all. But unless one knows the precise how and why of the matter, what security is there in advance for undertaking one more experiment of the kind under different conditions?

A real understanding of the science of fans has not been favoured, but rather greatly hindered, by the intrusion of purely trade interest into this highly debateable land. People with certain makes of fans to sell have succeeded in overwhelming the science of the matter with their interested clamour. It is the same with many other branches of mechanical engineering. With some energetic persons, the science of lifting weights does not exist outside the selling of their cranes. The "conveying" of materials; the destruction of town refuse; the manufacture of fuel gas; and other branches of trade that will occur to readers as examples—they have been forcibly monopolized for the benefit of particular firms in the business. The disinterested inquirer is reduced to the condition of being absolutely dependent upon these dealers for information as to what can be accomplished in these pseudo-proprietary lines, and how to do it. Such a state of things may be good for certain traders; but it is distinctly inimical to the spread of knowledge. What the dealer desires is to be able to tell his prospective customer not to trouble himself about the science of what is in his mind, but to buy the article recommended to him. He is assured that it will be cheaper, as well as less risky, to take this course. Is it not "standardization?" And how better can time, pains, and money be economized? There is in progress, happily for the general interest, a revolt against this ramming of proprietary appliances down the throats of purchasers. A well-known works engineer and manager said the other day, *à propos* of some machine tool he wanted, "These tool makers seem to think I exist merely to buy their tools. I mean to teach them that they exist in order to supply my requirements."

To return to the subject of fans for moving air or gas, the first case considered by the Committee is that of an air propeller working under the condition that there is no appreciable difference of pressure on its two sides. The simplest and commonest example is the propeller made like the screw-propeller of a steamship, set in a circular opening in a wall. Here the whole of the energy communicated to the fan, less the friction of the machine, is expended in setting the air in motion. Part of this motion is lateral, and therefore useless; and only about 40 per cent. of the energy expended is utilized in driving forward air in the direction parallel to the axis of the fan. Even so, the volume of air that can be propelled in this way with a minute expenditure of power is enormous. Mr. W. G. Walker has found that a simple three-bladed fan, 2 feet in diameter and revolving 600 times per minute, delivered 2420 cubic feet of air per minute for 0·0334 horse power communicated to the air. If the energy actually so communicated to the air is only 20 per cent. of that delivered to the fan, the consumption of power is still trifling.

This consideration is sufficient to account for the growing employment of this means of assisting ventilation. Since the work done by such a fan varies as the cube of its rate of revolution, it is an economy of power, as well as of wear and tear, to employ a fan of sufficient size not to require a very high rate of speed.

A different set of considerations altogether arise when it is a question of driving air against back-pressure. The expenditure of energy is greatly increased; and with certain back-pressure, a fan working at a given velocity will cease to drive forward any air. With screw-propeller fans, this limit is very soon reached, because the velocity of the blades is much less at the centre than at the periphery of the blades. Consequently, a much smaller resistance will suffice to drive the air backwards at the centre than at the periphery. As the resistance increases, so this loss of useful effect of the fan progresses, until at last the point is reached where the fan is merely churning air round and round within itself, without doing useful work. Where a propeller fan is fixed to discharge the air of an interior through an outside wall, the pressure of a contrary wind may reverse its operation. The passage of air backwards through the centre of a propeller fan may be remedied without increasing the speed, by blocking the central part, which is of little use in any circumstances ordinarily occurring

Next to be considered is the case of a fan exhausting or propelling air through a closed pipe or duct. This involves additional work; and it is evidently of great importance to keep the resistance offered by the duct within a reasonable limit. The resistance is a matter of the work expended in imparting velocity to the air; and this work varies as the square of the velocity of the air current. Hence it is very important that the duct should be of such a size everywhere that the velocity is moderate. A propeller fan is useless for high velocities or against much back-pressure; and a centrifugal fan is indicated. For the purposes of general ventilation, the Committee urge the preference for fans and ducts with wide openings; the fan being run at the lowest velocity adequate to secure under all conditions a sufficient air current. It is also pointed out that care should be shown in avoiding unnecessary additions to the amount of work to be done. Thus, all restrictions or obstructions of the air-duct, requiring air to pass at increased velocity, mean more work for the fan, since the work increases as the square of the velocity.

A rectangular bend in a duct produces a resistance equivalent to that caused by a 50 per cent. increase of velocity, or of 100 per cent. in the pressure needed merely to set the air in motion at the same velocity. Bends should therefore be made as gradual as possible. There is also a loss at the entrance of a duct equivalent to that caused by an increase of nearly a third in the velocity, unless the opening is trumpet-shaped. Then the frictional resistance of the walls of the duct must be taken into account. Its amount is proportional to the total internal surface of the duct, but inversely proportional to the sectional area. It follows that the duct should as far as possible be of such cross-section as will present a minimum of internal surface with a maximum of sectional area; and that one duct is preferable to many. Frictional resistance—skin friction—also depends on the velocity of the current. Were the walls of a duct of ideal smoothness, the resistance they would offer would vary directly as the velocity of the current. Actually, the skin resistance increases or diminishes more rapidly than in direct proportion to the velocity; but not so rapidly as in proportion to the square of the velocity. "The resistance from friction thus does not vary with the velocity according to the same law as the resistance due to the work required merely to impart motion to the air; and frictional resistance is of greater relative importance with slow than with rapid air currents, and is also much more important with long than with short ducts. It can often be more advantageously overcome by increasing the driving pressure than by increasing the sectional area of a duct."

We have quoted these remarks of the Committee because the last sentence gives the justification of the use of "boosters" for increasing the delivering capacity of a trunk gas-main. This is sometimes confused with what is called high-pressure gas distribution. The two things, though capable of existing together, are really distinct, and should be separately regarded. The delivering capacity of a given long, much branched and contorted, and probably furred and otherwise obstructed gas-main, is inadequate. What had better be done? Evidently, there are two courses open to be followed in such a case. Either, as the Committee say, the sectional area of the pipe may be enlarged (by putting in a new and larger one) or the driving pressure may be increased. Obviously, the latter is the alternative to be tried first, for reasons of expense and convenience. But even these reasons are not all. "Boosting" may be really the proper thing to do, even with a large pipe, because the causes of lack of delivering capacity (length, contortion, junctions, obstructions) are such as must appear sooner or later, more or less, in respect of any such pipe. Therefore, the possibilities of increasing the driving pressure should be exhausted before additional pipe provision is thought of. But it must not be forgotten that the range of possibility of boosting, or an initial increase of driving pressure, is still limited. It is limited by conditions quite other from those already considered. To overcome pipe resistances up to a standard of efficiency fixed by physical possibilities is one thing; to force these possibilities beyond themselves is another matter.

The limit of carrying capacity of a pipe or other conduit depends upon the velocity which can be imparted to the current; and this cannot be increased to infinity. The Committee cite various resistances to the flow of a gaseous fluid in a duct; but they naturally do not mention anything which lies outside of the ordinary practice. Otherwise they would have included eddies in their list. Up to a point, the carrying capacity of a pipe can be increased by raising the driving pressure; but beyond this point, which depends upon several conditions, any increase of such pressure will not materially increase the carrying capacity. If the pipe is closed at the other end, so as to create for itself a condition of static pressure, then the momentary discharging capacity of an opening of the pipe will be in proportion to this pressure. This is a different thing from the regular flow of the contained fluid, whatever it is. There is reason to believe that some gas engineers have allowed themselves to confound the two things—momentary discharge of gas through an orifice under high pressure, and conveying capacity of a long main under high pressure applied at one end. This difference exists also, and is made use of, in regard to the distribution of water over scattered rural districts. Here it is common to find miles of small mains—say, 3-inch only—laid for the service of a number of isolated consumers. The water in these small mains is maintained at a high pressure, with the effect that there is a good discharge for the time required for the service of any single consumer. A very few simultaneous tappings of the main would, however, grievously reduce its serviceability; but this risk is run deliberately, without any bad consequences in ordinary circumstances. Needless to say, the system is not adapted for dealing with fires. Within its limitation, the system economically fulfils its purpose. As complaints of insufficient supply arise, owing to increase of the number of consumers in any locality, a larger feed main is provided. The fact of air and gas being elastic bodies, which water is not, does not alter the nature of the problem of carriage and delivery, but only in degree. Whether the conveyor is dealing with a solid, a liquid, or a gas, it cannot be driven beyond a certain speed; although, curiously enough, it will leak for a short time at a much faster rate! This is a sort of paradox; but it frequently requires a paradoxical form of expression to describe a character of Nature.

PERSONAL.

We regret to learn that Mr. W. W. Topley, the Secretary of the Croydon Gas Company, is seriously ill. A month ago Mr. Topley was granted four weeks' leave of absence on the ground of ill-health; and he went to Bournemouth. Unfortunately, he became much worse; and he now lies, under medical treatment, in a very critical condition indeed.

We are sorry to learn that Mr. James Morris Gale, M.Inst.C.E., the Engineer to the Glasgow Corporation Water Department, has sent in his resignation of the position, on account of failing health. Mr. Gale has been connected with the water supply of the city for between fifty and sixty years, for forty-three of which he has been Chief Engineer; his first work being in connection with the construction of the Gorbals gravitation works. He was Assistant-Engineer during the construction of the Loch Katrine works; and latterly he carried through the entire scheme for the duplication of the water supply from that loch. Mr. Gale was born in 1830 in Ayr, and was educated at the local Academy. In 1844, he entered the office, in Glasgow, of his elder brother, Mr. William Gale, who was Engineer to the Gorbals Water Company. With a view to acquiring more than a merely practical knowledge of engineering, he attended the Glasgow University, and studied under Professor Macquorn Rankine and Professor Laing. The year 1846, however, saw the beginning of the Gorbals Water-Works, which gave him more than sufficient practical work to engage his whole attention. He continued in this position for eight years. In 1854, he was entrusted with the construction of the Balgray reservoir, the largest of the reservoirs connected with the Gorbals works, and was taken into partnership by his brother. At the same time, he prepared plans for an enlargement of the Gorbals water supply, which was considered as an alternative scheme to that of Loch Katrine. Though not adopted, the two eminent Engineers consulted by the Corporation on the subject—Messrs. Stephenson and Brunel—reported that it was the only plan which complied with the requisite conditions as to quality and quantity, and in their opinion, was the only scheme which could be usefully considered in comparison with the proposed appropriation of the waters of the lakes. Mr. Gale rendered able assistance to Kilmarnock, Hamilton, Dumbarton, Port-Glasgow, and Partick in securing a supply of water. When the undertaking of the Gorbals Water Company was acquired by the Glasgow Corporation Mr. Gale lent the Town Council every assistance; and in 1857 he was requested to act, in conjunction with Mr. J. F. Bateman, in the construction of the Loch Katrine works. Mr. Bateman completed his great task in 1859; and Mr. Gale was placed in charge of the works as the City Engineer. From that date forward these works and the city water supply generally have been Mr. Gale's constant care; and to his unremitting zeal the citizens of Glasgow and the dwellers within an extensive area owe their cheap and excellent supply of water.

NOTES.

Manufacture of Graphite.

In 1891, Mr. E. G. Acheson, while trying to obtain a hard crystalline form of carbon—to make diamond, in short—produced the new compound silicon carbide, now commercially known as an abrasive by the name of carborundum. Recognizing the value of his find, he proceeded to develop the manufacture and improve the electric furnace with which he worked. The method of manufacture followed was to fill a brick box, into the opposite ends of which carbon terminals projected, with a mixture of sand and coke, packed round a granular carbon core which connected the two terminals. When the current passed, this core became so hot that the carbon in the surrounding mixture reduced the silica and formed the silicon carbide. Usually a layer of graphite is formed between the core and the crystalline carborundum, due to the decomposition of a part of the silicon carbide lying nearest the path of the current. The granular carbon (usually coke) composing the core of the furnace also shows change under the high temperature; for some of the grains become quite soft, and act like graphite. Yet this change is but partial, and only occurs the first time of using the coke. No matter how many times it is repeated, it does not show any appreciable further change. Mr. Acheson made the observation that it is practically impossible to convert carbon directly into graphite; but that if the carbon is first combined chemically with some other substance, so as to make a carbide, this can be satisfactorily evaporated by intense heat into graphite. Artificial graphite electrodes are now made in this way; and graphite in other forms, including commercial blacklead, is manufactured, under Mr. Acheson's patents, from anthracite coal.

Fuel and Power Gas Progress in the United States.

Some striking gas power developments are reported by the "Engineering Record" for the United States, chiefly in regard to the work of the Westinghouse Company, who are installing some gas-engine central power stations in various localities. At the Winchester Repeating Arms Company, in New Haven, a power-house has been designed to accommodate a new gas-engine equipment; and the entire power for manufacturing and lighting the works will be supplied from it. The gas required is to be made by Loomis-Pettibone producers. The power-gas plant of the Consolidated Industries Company, at Batavia, New York, will be arranged to produce metallurgical coke and gas; the latter being used in gas-engines driving alternate-current generators. At Rockland, also in the State of New York, there will be an installation consisting of an independent gas-manufacturing plant on the Loomis-Pettibone system, and a power plant of Westinghouse direct-connected gas-engine generator units. The producer plant will supply water gas to the Ramapo Iron-Works and the Ramapo Foundry Company for heating and metallurgical purposes, and electric power to various other works in the neighbourhood, including a factory at a distance of four miles. The whole district, which is some fourteen miles in extent, will be supplied with electricity from this plant. The gas-engines here are of the new Westinghouse horizontal double-acting type, each of 350-horse power; the sets aggregating 1200 brake horse power. These engines are connected direct to Westinghouse polyphase generators, and are constructed to work in parallel. A 128-horse power vertical gas-engine will be used to carry light loads, and also to assist at peak loads.

Sulphurous Anhydride Power Attachment for Gas-Engines.

For some time past experiments have been in progress in Germany with a steam-engine in which the heat-efficiency of the steam is supplemented by sulphurous anhydride in the condenser. The heat vaporizes the compound; and the resultant gas is used in an auxiliary working cylinder. The exhaust from this cylinder is condensed by water, forming liquid which is pumped back into the power cylinder, and so used over and over again. It is easy to obtain in this way a gas pressure of 150 lbs. per square inch; and in the German engine, designed by Professor E. Josse, the power obtained by this means was between 30 and 40 per cent. of the total power of the steam-engine. Theoretically, this is quite correct. Starting with steam superheated to 200° or 300° Fahr., and finishing with a temperature of 71° Fahr. which is that of the sulphurous anhydride leaving the last cylinder, there is a theoretical efficiency of 53 per cent., of which the engine would probably realize 80 per cent. The device for utilizing the waste heat by sulphurous anhydride can be attached to any steam or gas engine. All that is needed for this is a safe, strong surface condenser. Indeed, it is thought that the largest field for this combined effect will be found in its application to gas-engines, in lieu of the cylinder-cooling water, and to economize the heat of the exhaust. Experiments in this direction are going on in Germany; one such combination motor having been running day and night for more than a year in an electric lighting station in Berlin. The only difficulty acknowledged so far has lain with the packing of the piston-rod of the sulphurous anhydride cylinder. It was unpleasant to have the smallest leakage of the gas into the engine-room. This trouble has been overcome by making the stuffing-box in two parts, which effectually stops the escape of the gas.

COMMUNICATED ARTICLE.

THE CHOICE OF GAS-FIRES.

By Thos. Fletcher, F.C.S., of Warrington.

The choice of gas-fires is a matter of importance to all; and there is no doubt that if the subject were properly understood, and the prejudice which undoubtedly exists against gas-fires could be removed, their use would be extended in a manner at present considered impossible. Having been more or less of an invalid for some years, I have had unusual opportunities for judging, not only of the comparative values of different systems, but also of the curious prejudices which seem to dominate the minds of many, who will not even allow their own common sense to guide them. One unfortunate point, which perhaps has done more to damage the reputation of gas-fires, is the persistency with which people will attempt to use them where a down-draught exists. The common remark is that they cannot have a coal-fire because of the smoke, and therefore they will have a gas-fire. Of course, it is not a success; and then people say that gas-fires are a total failure—that they tried one and will never try another. To attempt to show them that the failure is entirely the result of their own fault is as effective as arguing with a stone wall.

A very large proportion of medical men, on entering a sick-room, will at once insist on the immediate removal of a gas-fire. It may have been in use, with perfect comfort and success, for years; but this they totally ignore. They will not listen to any reasoning, or even have the fire tried in their presence; it must come out. They tried one once, and it smelt, &c., &c. Out it comes, to be replaced by a dirty, noisy, coal-fire, which is so irregular that equal temperatures and atmospheric conditions are impossible. Very few patients will fight the matter out; but when they do, and the gas-fire is what it ought to be, a useful convert is obtained.

The same remarks apply with quite as much force to trained nurses. One I had told me she had always had gas-fires removed from sick-rooms—not from prejudice, but because, in her long experience, she had never seen one that was satisfactory. They always smelt badly, or they gave no heat. She soon altered her opinion after the experience of a few days and nights with my own, which was an ordinary iron-fret fire, nursery pattern, with boiling-burner on the top; and she is now as strongly in favour of gas-fires as previously she was prejudiced against them. The same result occurred with my medical attendants. Instead of being determined to have the gas-fire out of the room, they have now adopted them in their own homes and consulting-rooms. One tells me that when he is called out in the night he warms some soup, or makes a cup of coffee while dressing; and so saves himself many a chill and risk of illness. When he returns, it is to a warm bedroom and more warm food, if his absence has been prolonged.

In children's night nurseries, among the little folks who, in the same day, will be in perfect health and then at death's door, a gas-fire and a quick supply of hot water, so easily obtained by gas, are a boon beyond any possible money value—actually, in many cases, a matter of life or death.

A very common question is: Which is the best gas-fire? There is no "best" for all purposes, but there is no possible doubt that, as a matter of comfort and health, by far the larger proportion should be radiant. Warmed air is much cheaper to obtain with any fuel; but this does not give the feeling of comfort, nor is it possible, without radiant heat, to keep the floor and feet warm—a fact easily proved by placing thermometers at different heights. I have repeatedly observed a difference of more than 60° between the floor and ceiling temperatures in rooms where a hot-air stove is used. This means cold feet and a headache to anyone sitting quietly in the room for any length of time.

This brings me to one point as regards heating which is, and has been, an unsolved mystery. Anybody who uses one room regularly would naturally think that, if the temperature were kept steady at 65° Fahr., the feeling of warmth would be always the same; whereas the room may feel sometimes warm and sometimes uncomfortably chilly under apparently identical conditions as regards ventilation and outside temperature. At first, I thought this could be explained by the varying amount of moisture in the air; but continuous watching of the hygrometer and thermometer together shows clearly that this is not the case. What the cause is I am totally at a loss to explain, or even to imagine; and it is quite evident that the matter of personal comfort is not to be judged by the thermometer or the hygrometer. There is an unexplained personal element which has to be considered. A steady temperature in a sick-room is not, in itself, sufficient. It must be varied according to the feeling of the occupant; and this is only possible with a good gas-fire. All the skill in the world will not make a room always comfortable where a coal-fire is used. It is far too unsteady, and too little under control.

Another most important point is the quick warming of food, &c.; and, as a matter of practical experience in my own case, a night rarely passes without the small boiling-burner being required. The same thing will occur, often both night and day, in nurseries. In many houses there is a room that is set apart as

a "den"—a private retreat for the master of the household and his friends; and a good gas-fire makes this comfortable at a much shorter notice than a coal fire, without the dirt and trouble. But, in this case, it is necessary to have the fire of ample power, with a large margin, so that the room can be used with comfort at a few minutes' notice in all weathers. A fire which is barely sufficient loses one of the greatest advantages.

TECHNICAL RECORD.

THE FUTURE OF COAL GAS AND ALLIED ILLUMINANTS.

By Professor VIVIAN B. LEWES, Royal Naval College, Greenwich.

[A Series of Cantor Lectures delivered before the Society of Arts.]

IV.—Monday, Dec. 15.

The title of "Allied Illuminants" presupposes a closer relationship than the mere fact of substances utilized for the production of light; and certainly no bond of alliance could be closer than that which exists between coal gas and oil as illuminants. Born and bred in the same cradle, they have walked hand in hand ever since. It was while Lord Dundonald was first distilling coal in order to obtain from it the coal naphtha that he also made coal gas; and though at that period interest in the liquid illuminant caused its gaseous brother to be overlooked, the work of Murdoch and the puffing of Winsor put coal gas into a position which caused it to outshine the liquid twin.

In treating of oil lighting as existing in the immediate past, and as destined to play an important part in the future, it is clear that the animal and vegetable oils, which were much in evidence in illuminating the dark ages, and forming a twilight to the brilliant illumination of the past century, may be disregarded; so that, considering only mineral oils, the relationship existing between coal gas and oil lighting is the closest that one can conceive. If certain classes of coal be distilled at a comparatively low temperature we obtain oil, and if other classes are distilled at a high temperature we obtain our coal gas; and for the past twelve years oil gas has played so important a part in the carburetting of coal gas, that the relationship between them becomes still more inseparable. In some parts of the world, Nature in her prodigality supplies natural gas; and even in this country some is to be found, and there are not wanting those who look forward to Sussex becoming a Pennsylvania on a small scale. However, natural gas is small in quantity as compared with the natural sources of mineral oil; and this gives the latter illuminant a distinct advantage.

The advent of the coal gas industry in the early twenties provided tar from which light oils could be obtained by distillation; and the consumption of these in the Read-Holliday lamp has ever since been a favourite source of light for the coster and the travelling showman. In this lamp, the principles which underlie many of our most modern developments for burning oil for heating and lighting are to be found, as it is a wickless lamp which gasifies the coal-tar naphtha that yields the flame—the flame itself providing the necessary heat to keep the supply of gas constant. Other lamps of the same type are also made for the consumption of oils of higher flash point. But although of great utility in illuminating open spaces, the danger of a leakage of burning oil, and the slight irregularity in the supply of oil to the vapourizing chamber, render them unfit for use in buildings containing inflammable matter. The Read-Holliday lamp was practically the only mineral oil lamp existing up to the middle of the last century; and 1850 marks the birth of the great mineral oil industry. James Young, whose name is as indelibly connected with mineral oil lighting as is that of Murdoch with coal gas, in 1847 discovered, or had pointed out to him, a leakage of oil from a seam in the Riddings Colliery at Alfreton. Collecting this oil, he succeeded in preparing from it, by distillation, a valuable lubricant. The demand for this, however, very soon exceeded the supply that he could obtain; and in his attempts to keep pace with the trade he had created, he found that the same oil could be obtained by the distillation of certain grades of shale, and so arose the Scotch oil industry.

The purpose for which the oil was obtained was at first purely that of lubrication; and the light oils which were distilled off from the heavier ones which were fitted for this purpose were practically a waste product, Although some attempts were made to utilize the lighter distillates for burning in a lamp, no practical results were obtained until 1853, when it was noticed that this oil was being bought at a very cheap rate, and was being exported to Hamburg. Curiosity being aroused, it was found that the oil was being used in Germany in lamps made by Stobwasser, of Berlin. This led to the introduction of these lamps into England, where they were afterwards manufactured, with improvements, by Messrs. Laidlaw, in Edinburgh. It was in 1859 that commercial circles in America were convulsed by the fever of speculation roused by Colonel Drake succeeding in obtaining petroleum by boring in districts where previously it had merely occurred as a scum on the surface of stagnant water; and the next year or two resulted in the flooding of the market with oil at prices never before deemed possible. This led to the introduction of lamps from Germany for its consumption. But American ingenuity very soon led to many improvements; and from 1859 to 1879 something like 1600 patents were taken out for lamps fitted for the consumption of oil. Nor was America alone in its efforts to improve the methods for the consumption of mineral oil. Some of the most distinct advances in this direction were made in England by such workers as Messrs. Hincks, Silber, and Defries, with the result that we have to-day lamps for the consumption of oil that develop from it an amount of light undreamt of in the early days of the oil industry; while the advances in the manufacture of the oil-lamp have been accompanied by the discovery of oil deposits in every part of the world.

As the oil leaves the well, it is a mixture of many hydrocarbons —mineral oils even varying among themselves in the class of hydrocarbons which are present in them. This crude oil has then to be subjected to rough fractional distillation, which yields, first of all, such easily volatilized products as petroleum spirit and the low flash-point oils; while those distillates that have a flash point of over 73° Fahr., and yet are of sufficient mobility to be fed with regularity by the capillarity of the wick to the flame, come under the heading of lamp oil, and are utilized in the ordinary mineral oil lamp. In the burning of such oil, it is drawn up by the wick from the lamp reservoir into the zone of heat created by the combustion of the flame, and is there converted into a gaseous mixture of hydrogen and hydrocarbons which yield the flame; while the actions going on within the flame yield the light which is emitted before the complete conversion, by combustion, of the flame gases into carbon dioxide and water vapour—the ultimate products of complete combustion.

The economic advantages claimed for the oil-lamp are, of course, based upon the amount of light that can be developed by the combustion of the oil. The most generally accepted estimate of this important factor is that given by Dr. Boverton Redwood, who states that the oil consumption with duplex burners giving a duty of about 28 candles averages 50 grains per candle per hour; while with argand burners, with a duty of 38 candles, it is about 45 grains per candle per hour. It must be remembered, however, that, although these are reliable results for the best types of lamp, these figures by no means represent the duty obtained by the ordinary consumer in daily practice from all types of lamp. The results obtained from a selection of the lamps in use to-day are shown in the following table:—

Results Obtained from Oil-Lamps.

Type.	Name of Lamp.	Grains of Oil per Candle Power per Hour.		Total Candle Power.	
		American.	Russian.	American.	Russian.
Circular wick.	Veritas, 60 line	64·5	112·5	122·5	78
	,, 30 ,,	42·5	50·0	60·0	60
	,, 20 ,,	43·75	58·5	40·0	35
	Ariel, 12 ,, (Centre draught)	52·8	70·9	18·0	18
	Reading, 14 line	97·9	85·4	12·0	12
	Kosmos, 10 ,,	63·9	97·2	9·0	9
	Wizard, 15 ,,	56·9	51·3	18·0	19
Flat wick. Single.	Wanzer (no glass)	42·6	48·3	17·0	15
	Solid Slip (Gauze and cone)	84·4	84·4	8·0	8
	Old Slip. (Fixed gauze)	60·9	89·3	7·0	7
Duplex.	Feeder Wick	56·2	55·7	20·0	22
	Ordinary	51·2	46·6	20·0	22

American oil—Specific Gravity, 0·7904; Flash point, 110° Fahr.
Russian ,, ,, ,, 0·823 ,, ,, 83° ,,

It will be noticed from this that, with the flat-flame lamps of the type first introduced, the American and Russian oil give practically the same result; while with the circular wick lamps the American oil appears to have a great advantage over the Russian. After prolonged burning, however, this difference is considerably lessened; and the same sort of results are to be found in the consumption of American and Russian oil in heating stoves.

Very little attention has been drawn to the amount of heat emitted by our illuminants, whereas it places a distinct limit upon the size and illuminating power of oil lamps; for although the illumination yielded by (say) the "Veritas" 60 line is very good, yet the heat given off would be absolutely insupportable in a dwelling room. Taking the composition of lamp oil as being 86 per cent. of carbon and 14 per cent. of hydrogen, the combustion of 1 lb. would give 47,056 B.T.U.; while 50 grains, yielding 1 candle of illumination, would give 336 B.T.U. One cubic foot of coal gas gives on an average 620 B.T.U.; and the following results are obtained on calculating the amount of heat emitted per candle by various forms of burner.

British Thermal Units Developed per Candle per Hour.

Oil lamp	336·0
Gas—flat-flame (No. 4 union jet)	310·0
Argand	207·0
Regenerative	88·0
Incandescent mantle	36·4

The advantages to be gained by the use of oil as an illuminant are most evident in country districts, where, as a rule, coal gas is dear; while its popularity would be even greater than it is were it not for the number of accidents that have occurred in the use of lamps.

We have seen that the introduction of the incandescent mantle has had an effect on the gas industry of the world that cannot be overrated; and it was natural therefore that its application to the flame produced by the gas of oil instead of the gas of coal should soon be attempted. It is clear that inasmuch as oil gas and oil vapours only differ from coal gas in the larger proportion and greater complexity of the hydrocarbon molecules present, it only needs a sufficiently large proportion of air to be mingled with the oil gas or vapour before combustion to make the flame available for the same method of developing light. The difficulties which exist in attaining this end are, however, very great, as the very richness of the hydrocarbons renders it a matter of considerable difficulty to get the necessary amount of air thoroughly mixed with the gas. A non-luminous flame can be obtained by burning a mixture of 1 volume of coal gas with 2·27 volumes of air; but if the flame be superheated, a certain proportion of luminosity will re-appear, as the increased temperature causes the decomposition into carbon and hydrogen of the hydrocarbon molecules in the gas, which could not take place when the gas was cool, owing to their separation and dilution with air. If a mantle be placed on such a flame, the superheating caused by the mantle itself will soon tend to the decomposition of the hydrocarbons in the gas, with the result that the mantle is blackened and rapidly destroyed. An increased proportion of air, however, entirely alters the flame; and the hydrocarbon molecules being burnt up before impact with the heated surface of the mantle, all chance of blackening is avoided.

With the flame yielded by gasified or vapourized oil, this trouble proved to be a serious one, as although it was an easy matter to obtain a non-luminous flame, yet blackening made its appearance directly the mantle was placed over it; while if a further supply of air was brought into the flame, the flame required constant attention—a factor which was quite sufficient to prevent its adoption in daily practice. Another source of trouble was found in the wick, the slightest irregularity of which seriously interfered with the correct working of the lamp; and it is by no means an easy matter to obtain a wick that is perfectly symmetrical. So that the wick was relegated to the duty of drawing the oil up into a vaporizing chamber where the oil gas was produced, which, on then being mixed with air, gave the flame. In the earlier types of incandescent oil lamps, a circular wick was generally used to bring the oil to within a short distance below the burner head; and at this point the oil was vaporized by the heat conducted from the flame by the metal of the burner. A central tube furnished one air supply; while a second was so arranged as to discharge itself almost horizontally on to the burning gas at the base of the flame, resulting in a non-luminous and very hot flame. The necessity for careful and constant attention, however, and the irregularity of their performance, prevented their attaining commercial success.

An ingenious lamp was devized in which oil and water were vaporized by the heat of a small oil-lamp in a lower and separate chamber; and the mixture of oil gas and steam was then burnt in a burner-head with a special arrangement of air supply, heating a mantle suspended just above the burner head. The perfect petroleum incandescent lamp, however, on any of these systems has not yet been made; but with one lamp with which I experimented, it was easy to obtain 3500 candle-hours per gallon of oil, or three times the amount obtainable from the oil when burnt under ordinary conditions. As early as 1885 Mr. Arthur Kitson attempted to make a burner for heating purposes on the principle of injecting oil under pressure from a fine tube into a chamber where it would be heated by the waste heat escaping from the flame below, and the vapour so produced then made to issue from a small jet under the pressure caused by the initial air pressure and the expansion in the gasifying tube, This jet of gas was then led into what was practically an atmospheric burner, and drew in with it sufficient air to ensure its combustion with a non-luminous blue flame of great heating power. At this date, the Welsbach mantle was yet in its infancy; so that a mantle of platinum wire was at first used to obtain the light from this flame. But, like all other platinum mantles, although the light at first was very fine, yet the illuminating power rapidly fell off, owing to the action of the flame gases on the platinum. The perfecting of the Welsbach mantle, however, gave the finishing touch to this method of consuming the oil; and the Kitson lamp has now attained an assured success, the only drawback being that its use demands a certain amount of intelligent care. But where this has been forthcoming, the lamp has fully answered the high expectations formed for it.

In this lamp, as used for street lighting, the oil reservoir is in the base of the pillar, and is made of steel and tested to a high pressure in order to ensure its being absolutely safe at the pressure at which it is used. A small pump enables the oil to be put under a pressure of air amounting to 50 to 60 lbs., by which it is forced up through a small capillary tube to the burner head. Here it passes through a small cross-tube containing filtering material, for removing any solid particles in it, and is then ejected through a small aperture into a lower cross-tube placed immediately above the top of the mantle, the heat from which, passing upwards, causes vaporization and the partial gasification of the oil. The mixed gas and vapour rush out under considerable pressure from a small aperture in the side of the far end of the tube down what is practically an inverted bunsen tube, through the holes in the side of which it draws in sufficient air to render the flame at the burner-head not only non-luminous, but sufficiently oxidizing in its character to prevent any deposition of carbon on the mantle. By the time the burner-head is reached, the gas is practically down to atmospheric pressure again; so that wear and tear of the mantle is not excessive.

The difficulties that were found with the forms of this lamp in use down to six months ago were the occasional clogging of the small vapour hole with carbon, and the risk that the oil might be turned on accidentally when it was not in use, or that a defective valve might cause a slight leakage of oil through the vapour tube into the burner, which might, under certain circumstances, have resulted in the auxiliary flame turned on to heat the vapour tube causing a slight flare. These objections have now, however, been surmounted; and the vapour tube is made with a needle holder and needle running longitudinally through it, so that the small vapour hole can be cleared in case of any stoppage by simply pulling a small chain attached to a lever arm working the needle, while any chance of oil escaping, either from a leaky valve or turning on the oil supply to the cold lamp, is prevented by a thermostatic valve, which prevents any access of oil to the vapour-tube until it is at a sufficient temperature to properly vaporize the oil. This valve operates by the difference in expansion of the two metals employed in its construction, and as long as the arm is cold entirely cuts off the oil, and the valve being above the vapour tube it cannot get hot enough to release the oil until the vapour tube has got to the proper temperature.

These modifications are a distinct improvement. Other steps in the right direction are heating the air supply before it enters the mixing tube, and so doing away with any danger of condensation of the oil vapour, and also simplifying the general arrangement of the burner, and preventing a good deal of the hissing sound which was an objectionable feature of the older type. It is satisfactory to find that the safety of the system is vouched for by the fact that out of the thousands of installations that have been put up in various parts of the world, no fire has originated from its use; and the progress during the past few years in new installations has been very satisfactory. One of the great advantages which it has over the intensified systems of incandescent mantle lighting in order to obtain big units of illumination, is that it does not necessitate disturbing the streets, as the whole installation is self-contained. Careful experiments that I have made with the lamp show that, with a large single burner, it is perfectly easy to obtain illuminating values of from 1000 to over 1200 candles, and that, with large installations, 1000-candle power could readily be obtained for 1d., which is only one-third of the cost of the same amount of light from the electric arc. The recent success of its adoption for the illumination of large open spaces in London and other cities points to the fact that it is destined to play an important part in the illumination of the future.

Air carburetted with the vapour of light petroleum yields an illuminating gas of considerable value; and several attempts have been made to utilize this for incandescent lighting. A successful form, which gives an idea of the systems most in use, is that devised by Mr. Van Vriesland, which is used in several places under the name of "Aerogene gas." In this arrangement, a revolving coil of pipes continually dips into petroleum spirit contained in a cylinder, and the air passed into the cylinder through the coil of pipes becomes highly carburetted by the time it reaches the outlet at the far end of the cylinder. The resulting gas, when burnt in an ordinary burner, gives a luminous flame, and can be burnt in atmospheric burners differing but little from those of the ordinary type. With an ordinary Welsbach "C" burner, it gives a duty of about 30 candles per foot gas consumed; the high illuminating power being due to the fact that the gas is under a pressure of from 6 to 8 inches. A complete installation of this plant is to be found at the village of Breukelen in the Pays-bas, where it is used for street as well as house lighting. There are about 2 miles of mains, which in one place pass under a canal; and although one would expect in cold weather that there would be a serious deposition of the vapour, in practice this did not appear to be the case. It was found, however, that the evaporation of the carburetting material was much higher in the summer than in the winter; and this necessitated an adjustment of the air supply to the burners. But when once this had been made, the lighting power of the installation was as high as before, and worked in a perfectly satisfactory manner.

I made tests of the light given by the mantles close to the works, and also at a distance of half-a-mile away, after the gas had passed below the canal, and found that there was a loss of only about 1 candle per cubic foot in illuminating power during distribution. In considering the effect to be produced with the incandescent mantle by the combustion of gas in the atmospheric burner, we saw the great advantage of mixing the air with the gas before combustion at a point some distance from the burner-head, and although this is of necessity done in using carburetted air, as in the Van Vriesland and kindred processes, yet a further extension of the principle gives greatly enhanced results, and gets over the difficulty which hampers all other processes due to over-carburation in hot weather. In the Hooker process, which I have examined in conjunction with Dr. Boverton Redwood, the

air is only carburetted to the point at which it gives a non-luminous flame—that is, nearly the whole of the air needed for the combustion of the petroleum vapour is mixed with it before combustion, and this mixture is then consumed in burners of special construction, which eliminate any risk of a flashing-back, with the result that a great gain in illuminating value is obtained; and this process promises results of the highest importance.

A very ingenious table-lamp for burning petroleum vapour with the incandescent mantle has been devised by Mr. Legge, in which a reservoir filled with sponge and other absorbent material is saturated with petroleum spirit containing the volatile hydrocarbons in solution; and the vapour from this, descending by gravity to the burner-head, draws in the required volume of air for its non-luminous combustion, and gives a light of about 40 candles when used with a mantle. Such a lamp has points of convenience and value where coal gas is unattainable.

Yet another allied illuminant, which has been steadily and quietly making headway during the past few years, is acetylene, which, although the youngest member of the family of illuminants, is one which has already shown itself an important factor in illumination where coal gas cannot be obtained. I have so lately dealt with the subject in a previous course of Cantor lectures that there is no need now to go into details of its rise to favour, or the methods by which it is produced from the electrically-born calcium carbide. Although much hampered in its progress by the determined booming of improper forms of apparatus that gave rise to much trouble and waste, it has gone forward without a check, and improvements have been made in all directions. There are several generators on the market which leave little or nothing to be desired in their construction, as they are simple and effective; and for country house lighting the beauty of the light has led to its firmly establishing itself as a favourite.

In the early days, bad generators and smoking of the burners proved real difficulties; but the improvements in burners, as well as in generators, have been of a marked character. Besides the good burners of Continental origin, Bray is now making some excellent ones, which show an improvement on the older forms in that they can be turned down without any smoking. This will do away with the inconvenience inseparable from the older forms of burners, of either having to turn out the jet or leave it burning at its full height; and the possibility of bye-passing the gas, and so keeping the burner low when not required, will undoubtedly prove a great incentive to the adoption of acetylene for the lighting of country railway stations in place of the dim religious oil-lamps now in use. The improvements which have marked the last few years in connection with acetylene are largely due to the labours of the Home Office Committee on the safety and efficiency of various forms of acetylene generators, and also to the work of an excellent Acetylene Association, which has been formed to deal with all matters relating to calcium carbide and acetylene in the interests of the public and of the industry. The Association has already formulated regulations for the public guidance, which have met with the approval of the Home Office authorities and also of scientific and practical men.

Like many new industries, carbide and acetylene have for a period suffered from over-confidence on the part of many of their earlier supporters; and on the Continent, where large water powers were available, factories were established one after another, as if it were only necessary to make unlimited quantities of carbide in order to ensure a demand for it. The result of this was that for a time there was considerable over-production, and capitalists and shareholders interested in carbide works suffered severely in pocket, as, although the growth of the industry was wonderfully rapid, the supply was so great that stocks accumulated, and many factories had to close, while others worked to a small extent only of their output. The industry has now recovered, however, from this plethora of material, and this year there has been a danger of going to the other extreme, and at the present moment something closely approaching a carbide famine exists in some countries. The price of carbide, however, has remained fairly constant. Even during the period when large stocks were being held, it never fell to any very low figure; while so far the scarcity has not forced the price up to any great extent.

At the present time the annual consumption of carbide on the Continent for railway, domestic, and village lighting is probably not less than 40,000 to 50,000 tons; while in the United States and Canada the yearly consumption is not less than 20,000 tons, and fresh works are being erected to provide for the rapidly-increasing demand. The Colonies are being fed with carbide, both from the European factories and from America. In Prussia, something like 6000 tons are used annually on the railways, which almost entirely employ a mixture of 25 per cent. of acetylene with 75 per cent. of oil gas for lighting all railway carriages—such a mixture giving a remarkably fine illumination. In England, however, this system has not yet received a fair trial, as, although the Home Office has sanctioned the use of such a mixture, the railway authorities have not yet done more than experiment with it in a very haphazard and unsatisfactory manner.

For the illumination of railway carriages, trams, and omnibuses, there is no doubt that acetylene has an enormous field before it. For some months the public in London were educated in the lighting power of acetylene as applied to omnibuses, and although, owing to the faulty form of generator employed, they not only had ample illumination, but also an occasional whiff of highly characteristic scent, at the same time it was realized that the ability to read the halfpenny Press with ease and comfort was a distinct advantage over the oil-lamp which had previously made the darkness visible. But, unfortunately, there were difficulties in details which prevented this from proving economically successful, as, in the first place, acetylene generators in which the supply of water to carbide is so regulated as to give the volume of gas required to feed the burner in moving vehicles is under considerable disadvantages, owing to the jerking and jolting, which upsets the arrangements for bringing the water uniformly to the carbide; while the lamps, being lighted at irregular hours and used for uncertain lengths of time, were another difficulty to surmount. A charge of carbide sufficient for the maximum possible supply must always be put in the apparatus; and if at the end of the day carbide still remains undecomposed, there is no help for it but to remove it with the sludge, and to replace it by a fresh charge. Moreover, a large amount of labour is entailed in cleaning and charging; while there are very grave difficulties in dealing with the large quantities of lime residue in a big city like London.

These troubles, however, are now in a fair way to be satisfactorily overcome by the introduction of acetylene dissolved under pressure in acetone; the solvent itself being absorbed by porous materials with which the cylinder is filled. The early researches upon compressed and liquefied acetylene show that it could be exploded under circumstances which made it inadvisable that it should be freely employed; while solutions of acetylene under pressure in acetone, although less liable to explosion, still could not be said to be sufficiently free from danger for general use. It has been discovered, however, by Messrs. Janet and Fouche that when the acetylene is dissolved in acetone absorbed by porous materials of the right kind under ten atmospheres pressure, it is impossible to produce explosion, even when electric sparks are passed through the containing cylinder, or platinum wires are fused in it. Exhaustive tests in France demonstrate the absolute safety of acetylene compressed under these conditions.

Under this new system, acetylene is evolved from carbide in the ordinary way, and, after proper purification, is compressed under 10 atmospheres into cylinders containing a porous medium of 80 per cent. porosity, soaked with 43 per cent. of the capacity of the tube with acetone. In this way, 1 cubic foot of cylinder space is found to hold 100 cubic feet of acetylene, which is again to a large extent given off when the pressure is reduced by opening the stopcock of the cylinder. Supplied to burners through proper regulating apparatus, this gives a magnificent illumination. Such cylinders of small size, fitted to trams and omnibuses, are perfectly controlled by simply turning a cock; so that all waste of gas, trouble with residue, and smell are obviated. For railway lighting, the same method can be adopted with large tanks of the same character as those now used for compressed oil gas, but filled with the right form of briquette.

From the earliest introduction of acetylene, attempts have been made to utilize it with incandescent mantles; but under the pressures which are usually obtained from the ordinary generating apparatus, this has been a practical impossibility, as although burners have been devised which for a short time gave a magnificent light with the incandescent mantle, the difficulty of preventing the flashing-back in the burner tube with considerable explosive violence that blew the mantle to pieces, was very troublesome to obviate. With acetylene under pressure in acetone, however, any desired pressure at the burner can be obtained; and with a pressure of 8 inches and upwards, an acetylene burner can be made to work perfectly well with a mantle—the maximum illuminating power being obtained at a pressure of 10 inches, when a light of 146 candles per cubic foot of acetylene consumed can be secured. If the pressure rises above this point, although the total candle power is increased, the duty of the mantle falls. The results I have obtained are shown in the following table:—

Acetylene with Incandescent Mantles.

Pressure.	Consumption per hour.	Light.	Candles per Cubic Foot.
Inches.	Cubic Feet.	Candles.	Candles.
8	0·883	65	73·6
9	0·94	72	76·0
10	1·00	146	146·0
12	1·06	150	141·2
15	1·25	150	120·0
20	1·33	166	124·8
25	1·50	186	123·3
40	2·12	257	121·2

Another use to which the high-pressure acetylene in acetone can be put gives promise of considerable commercial value, and depends upon the great calorific intensity which can be obtained from a flame of acetylene fed with oxygen. Many attempts have been made to utilize acetylene in this way; but the intense heat has always resulted in the choking of the burner by carbon liberated in the form of graphite from the acetylene, which gradually closes up the jet in any ordinary oxy-hydrogen blowpipe. A new burner, however, has now been devised, which is so constructed that this trouble is surmounted, and a flame of enormous calorific intensity is produced, which is far greater than that obtained from the oxy-hydrogen blowpipe; while, owing to the high temperature which exists in the flame, and which is well above the dissociation point of water, sufficient hydrogen is present to render the flame highly reducing.

DETERMINATION OF WATER IN TAR.

The following is a description, taken from a paper in the "Journal für Gasbeleuchtung," of a method for determining the amount of water in tar, devised by Dr. J. Becker, the Chemist to the Frankfort Gas Company.

Buyers of tar often complain that it contains an excessive percentage of water, though the seller has not observed any appreciable separation of water when sending off the tanks. The reason is, perhaps, that the water is distributed in fine particles in the tar, and consequently a separation—*i.e.*, escape to the surface—is not possible, because the viscosity of the tar surpasses the ascending force of the specifically lighter water. The percentage of ammonia salts in the water in tar is also often so great that the specific gravities of the water and of the tar come very near together; and hence separation does not take place. It appears desirable for the seller to have a definite criterion of the percentage of water in his tar. He should be in a position with but little expenditure of time, to make a fairly exact test of the tar. After many attempts, the author has succeeded in devising a method and apparatus which give results of great accuracy in a very short time. The method depends on distillation *in vacuo*, while the air which passes into the vacuous flask keeps down the frothing of the tar, which at first is very marked.

The apparatus (fig. 1) consists of a spherical flask A (of 4 to 5 litres), with the head B, a Liebig condenser C, and a spiral condenser D, which, together with a globular condenser F, discharge into the receiver E. There are also a powerful water-jet air-pump P and the pressure-gauge M, and between them the vessel W. Water flows through the apparatus thus: Condensing water runs from the water-tap U through the pipe S, and in turn through the condensers F C D, and then flows away at O; while the vacuum may be said to pass along in the same order to the spherical flask A.

A test is made in the following manner: The flask A is charged with about 1 kilogramme of the tar to be examined, and is then connected with the condenser C, as shown in the illustration. The flask (which rests on wire gauze, and is surrounded with asbestos) is now heated until, with the cock K open and the clip I closed, the tar begins to boil, as indicated by numerous rapidly-rising little bubbles. The tap K is then closed, and the suction-pump is started. It is best to distil at first with a vacuum of 400 mm., and towards the end of the distillation with one of 700 mm.—that is to say, with the column of mercury in the pressure-gauge at 40 or 70.

The tar begins to froth strongly, and rises quickly in the flask up to its neck. Slight pressure on the clip I will allow air to run into the flask, and drive the froth of the tar down. This is continued until the tar has lost nearly all its water, which can be recognized by the cessation of the cracking noise in the flask. The distillation is continued, until finally, at the highest vacuum, oils only pass over, and the sides of the flask, which were black at first, become clear when viewed with a flame held behind the flask. As soon as this stage is reached, the distillation can be interrupted by first opening the clip I, and then slowly shutting off the suction-pump. The water and oil distilled off will have collected in the receiver in distinct layers—water below, oil above. The water is run off into a previously weighed beaker, which is then weighed again.

It is best to make two determinations one after the other. Each determination occupies, after a little practice, about three-quarters of an hour. If by any chance the tar should have risen up into the condenser C, the clip I is kept closed, and the cock R at the upper end of the spiral condenser is opened, so that air passing in drives the tar back again to A.

The method described admits of the oils being determined along with the water; but as soon as naphthalene begins to be

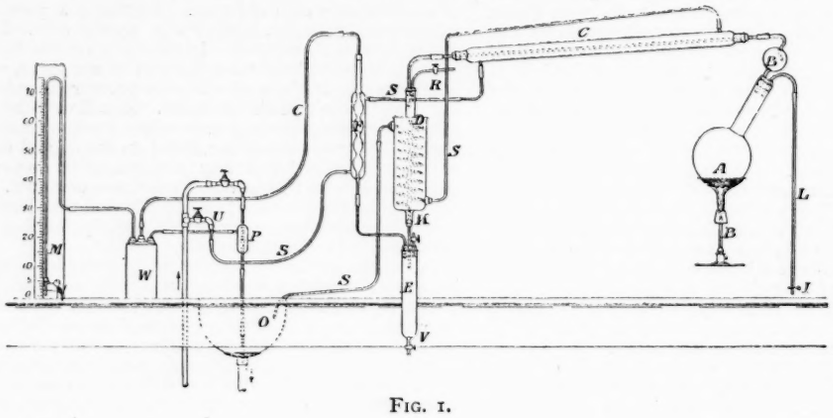

FIG. 1.

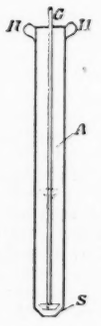

FIG. 2.

deposited, the Liebig and spiral condensers must be emptied of water by taking the pipe S off the cock U, while the globular condenser remains filled. It has been found that this extensive system of condensers is necessary, in order to condense all the vapours. During distillation also, a good vacuum must always be maintained, so that the inflowing air overpowers the frothing tar. If the tar should froth too violently, the flame under the flask must be turned lower for a short time. The whole process is so simple that any laboratory assistant can learn it, and carry out the test alone. In the laboratory of the Frankfort Gas Company, over 500 determinations of water in tar have so far been made.

In order to determine to what degree this method is accurate, the author has repeatedly made the following experiment. Tar, freed from water by repeated distillation, has been again diluted with the oils which had been distilled off, after drying over calcium chloride. Then 100 grammes of the water distilled from it were added, and a water determination was made as usual. Of the 100 grammes of water, 98·5 grammes as a minimum and 99·6 grammes as a maximum were recovered. Consequently, the result is a very accurate one for a technical determination. Instead of 5 per cent. of water, as many tars have, in the most unfavourable case 4·9 per cent. would be found, which difference of 0·1 per cent. scarcely comes into account. Parallel results also of two tests on the same tar show little deviation, as *e.g.*—

I.		II.		
4·90	..	4·89	per cent.	of water.
4·45	..	4·44	,,	,,
4·44	..	4·42	,,	,,
5·41	..	5·41	,,	,,
3·56	..	3·56	,,	,,
3·21	..	3·19	,,	,,

The next question is how to obtain a good average sample from a tank of tar. For this purpose, the author has had the sampler (fig. 2) made, in which is a sheet-iron cylinder, 4 inches in diameter and 40 inches high. Its lower end consists of a cast-iron conically turned tip S, with an opening 1½ inches wide, in which a moveable solid cone attached to a rod G fits tightly. In taking a sample, the cone is drawn up to the position shown by dots, and the vessel is slowly lowered into the tank. When it has reached the bottom of the tank, G is slowly lowered until the opening is closed. The vessel is then drawn out by the two handles H, and by lifting the cone is emptied into any receptacle in readiness. Samples are taken from various places and put into the same receptacle, which is well shaken before the tar is analyzed. To protect the sampler from becoming heavily coated with tar, it can be stood after use in a vessel of the same height filled with tar-oil or benzol.

By this method of testing, many disputes between buyers and sellers are said to have been settled. Dr. Becker recommends that every tank of tar be tested before sale as to its percentage of water, or that, if all the tar is stored in one well, which rain water cannot enter, a test should at any rate be made from time to time on the tar in the well.

Benzene Manufacture in Russia.—A factory has been erected in Russia for the production of benzene from naphtha on a commercial scale. The process worked is that of Nikiforoff by a double distillation of naphtha or naphtha residues; the hydrocarbons being broken up by the employment of high temperature and pressure. The first distillation and decomposition is effected in two furnaces constructed for two or three days' continuous working. The first distillation yields 38 per cent. of tar, half of which consists of aromatic hydrocarbons, which furnish benzene, &c., on the second distillation. It is proposed to utilize the coke, gases, and heavy hydrocarbons for the purpose of fuel. The raw material is stated to yield 12 per cent. of benzene and toluene, 1 per cent. of anthracene, and from 2 to 3 per cent. of naphthalene. The crude benzene is twice distilled, the second time in a Savalle column.

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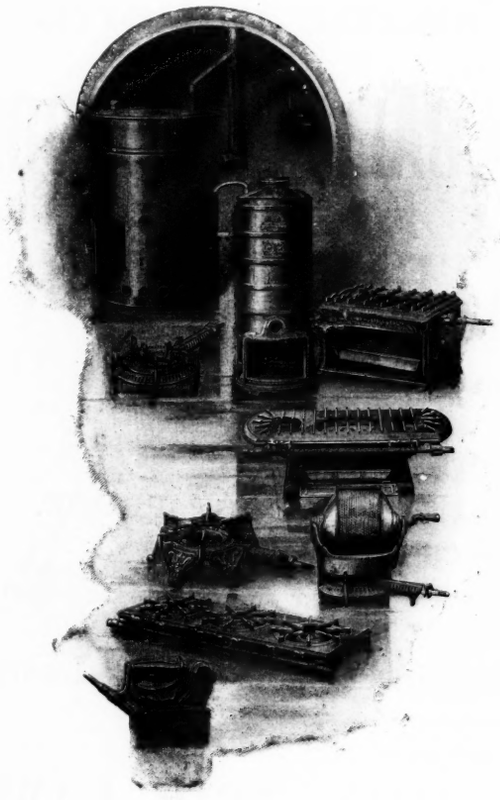

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ALL FLASH-LIGHTS ABOLISHED.
ALL FLAP-DOORS ABOLISHED.
ALL LAMPS WIND, RAIN, AND DUST PROOF.
GREAT SAVING OF MANTLES.

The saving in Bye-Pass Gas, Labour entailed, and other necessary expenses incidental to the Flash-Light System of Lighting amounts to

Over £30 Per Annum for each District comprising 80 Lamps.

IN ADDITION TO THE ABOVE,

1200 OF SUGG'S PATENT BALL TRAP LAMPS

HAVE BEEN IN USE

IN THE CITY OF WESTMINSTER

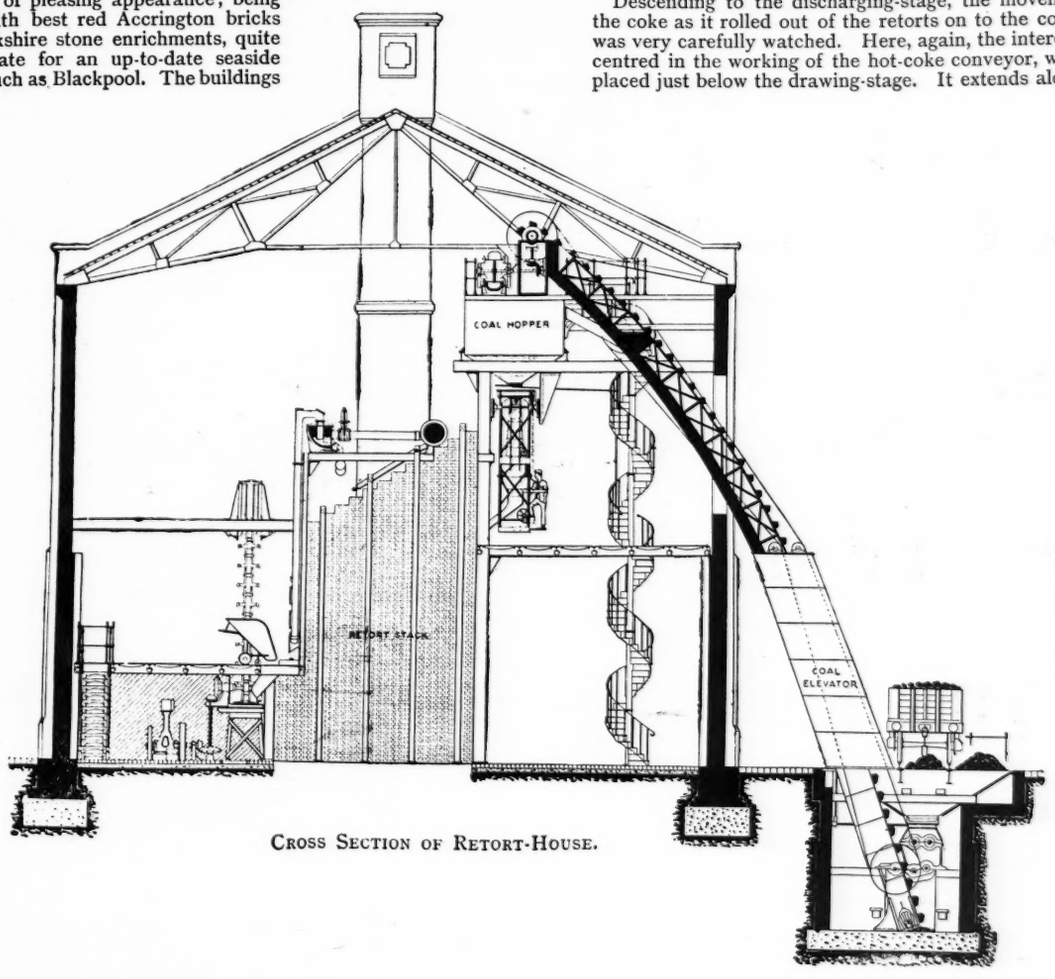
FOR THE PAST TWO YEARS, GIVING EVERY SATISFACTION.

VINCENT WORKS, WESTMINSTER.

NEW GAS-WORKS AT BLACKPOOL.

The occasion of the recent annual inspection by the Gas Committee of the Blackpool Corporation, accompanied by the Mayor (Alderman James Heys), of the important establishment under their charge, affords an opportunity of giving our readers a description of the works which have been erected to meet the increased demand for gas. They have been added to the older works—the two sections being connected by a subway under the railway; and the general arrangement of both works is shown upon the ground plan, next page. The site is that of a treacherous bog, having once formed a lake or "Black pool," since drained, from which locality the town in its infancy took its name. This necessarily entailed considerable difficulties, and required the laying of costly foundations.

Approaching the works from the subway, the buildings are arranged on each side of a main avenue 50 feet wide, with land for their elongation when necessary. The elevations of the buildings are of pleasing appearance; being faced with best red Accrington bricks and Yorkshire stone enrichments, quite appropriate for an up-to-date seaside resort, such as Blackpool. The buildings are in three blocks, comprising the retort-house, 270 ft. by 70 ft.; the purifying-house, 165 ft. by 82 ft.; and the machinery block, including the meter-house and water-gas house, 180 ft. by 54 ft., together with an enclosed shed for housing the washers, pump, &c., all under cover.



Cross Section of Retort-House.

It is worthy of mention that, though each block and section of plant was let to different contractors, when all the contracts were completed, the sum paid was actually £1000 less than the original tenders. The cost per foot cube of each block of buildings completed was as follows: Retort-house, 1⅜d.; purifying-house, 1½d.; Machinery block, 2¼d. (this block having enamelled glazed brick walls inside).

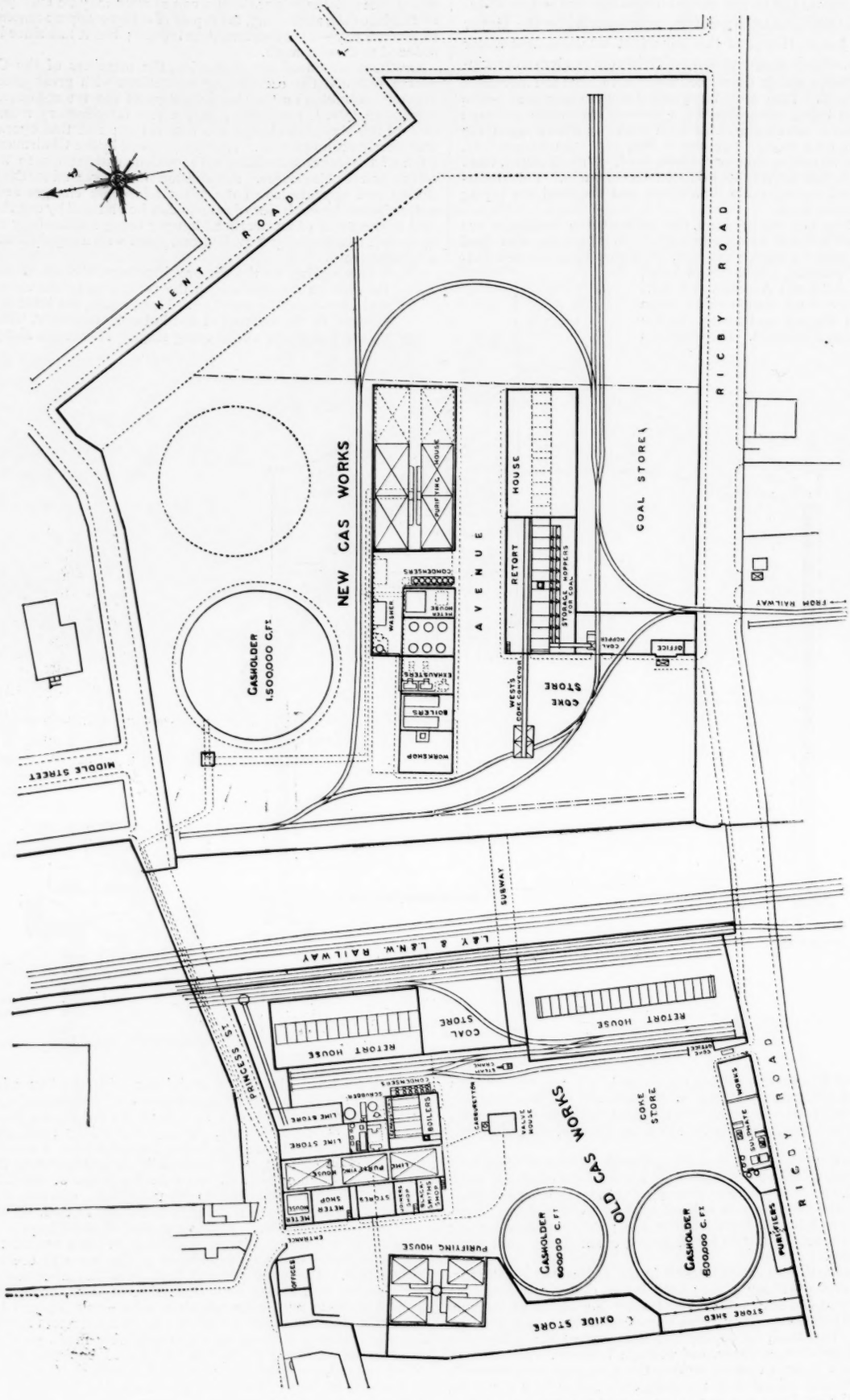
The principal features of interest in the new works are the carbonizing and purifying plant; both being departures from the type in use at the old works. The former is a stack of inclined retorts, with coke-conveyor, consisting of ten arches of 80 through retorts 20 feet long, occupying half of the retort-house, together with coal breaker, elevator, and storage hoppers. These combined with a waggon tipper complete the automatic arrangements whereby coal is delivered at the works, converted into gas, coke, &c., and the products sent to the consumers, without having been touched by a shovel.

As the works have been in use during the last season, all the preliminaries attending the starting of the new plant have been gone through, very good work resulting. The great importance which some of the minor details can assume may be exemplified by the fact that, at starting, the repair of retort-stoppers amounted to seven a day—a very serious item indeed; but it has since been reduced to three a week.

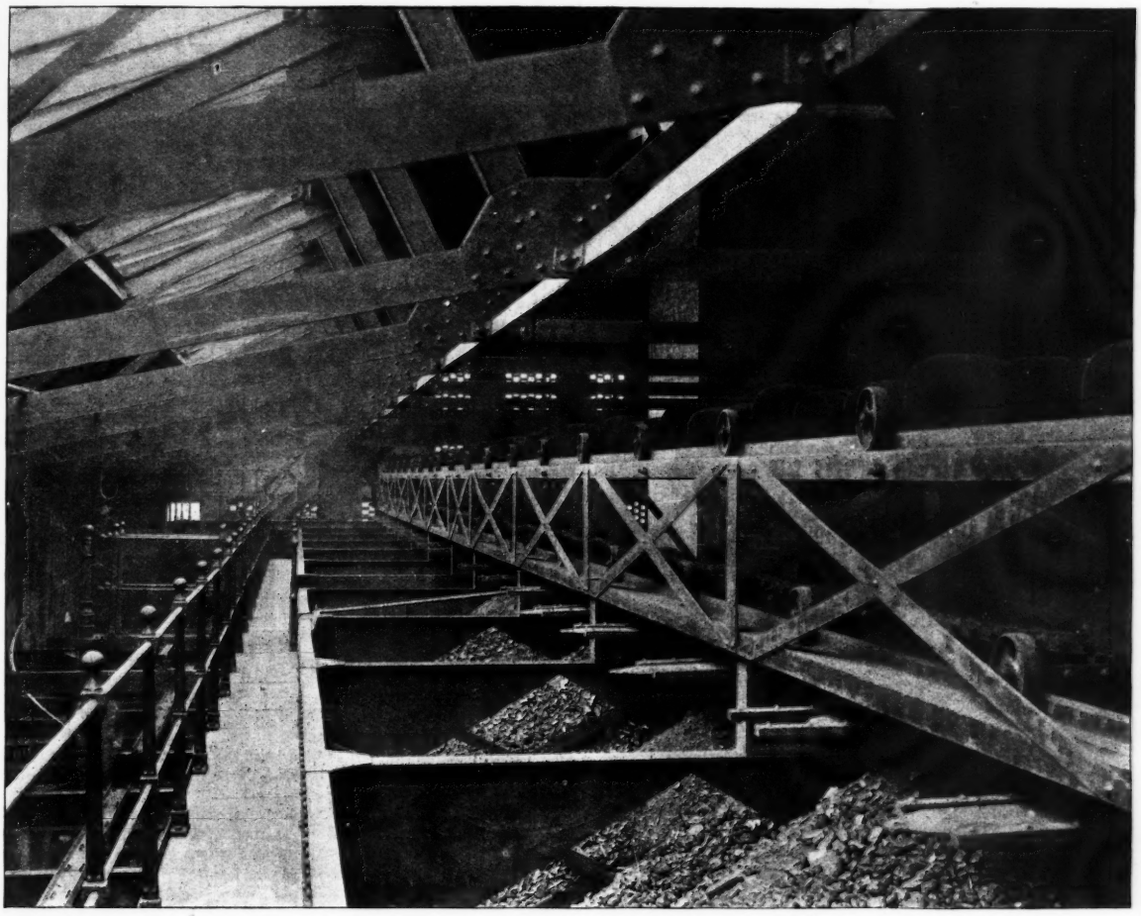
On the occasion of the inspection, the members of the Committee watched the carbonizing operations with great interest. Having assembled on the charging-stage of the retort-house, the Chairman (Mr. J. Battersby), after a few introductory remarks, invited the Mayor to charge the first retort; and this operation was neatly accomplished. He was followed by the Chairman and each of the other members, with evident satisfaction to themselves and the Engineers. Admiration was expressed for the neat design and appearance of the West telescopic charger and its action, whereby each tier of retorts can be charged by one shoot; and in the event of an overhead hopper being accidentally short of coal, it can be easily travelled and filled with a supply from the adjoining store.

Descending to the discharging-stage, the movement of the coke as it rolled out of the retorts on to the conveyor was very carefully watched. Here, again, the interest was centred in the working of the hot-coke conveyor, which is placed just below the drawing-stage. It extends along the front of the ten beds, and on arriving outside the house is continued up the incline to the hoppers—a total distance of 250 feet. It receives the red-hot coke *en masse* from the retort, 5 cwt. in bulk being dropped thereon. This is trained by the horizontal movement of the chain and a balance-flap to form a continuous layer of coke thereon, to be automatically quenched on its way to the shoots or hoppers. The particular shape of the links enables the bulk of the coke to be practically carried, and not scraped, along; thereby making no more breeze than the barrow or coke-waggon system. This is a matter of great importance at Blackpool, where very large quantities of coke are sent away owing to there being no industries in the town to use up the production. The conveyor has been at work rather more than six months, and shows very little sign of wear, though it dispenses entirely with coke wheelers, who would amount to four men per shift for the ten beds when all the retorts are in use. Damage to any of the links can be quickly made good, owing to their shape. The Contractors for the carbonizing plant were West's Gas Improvement Company, Limited, of Manchester.

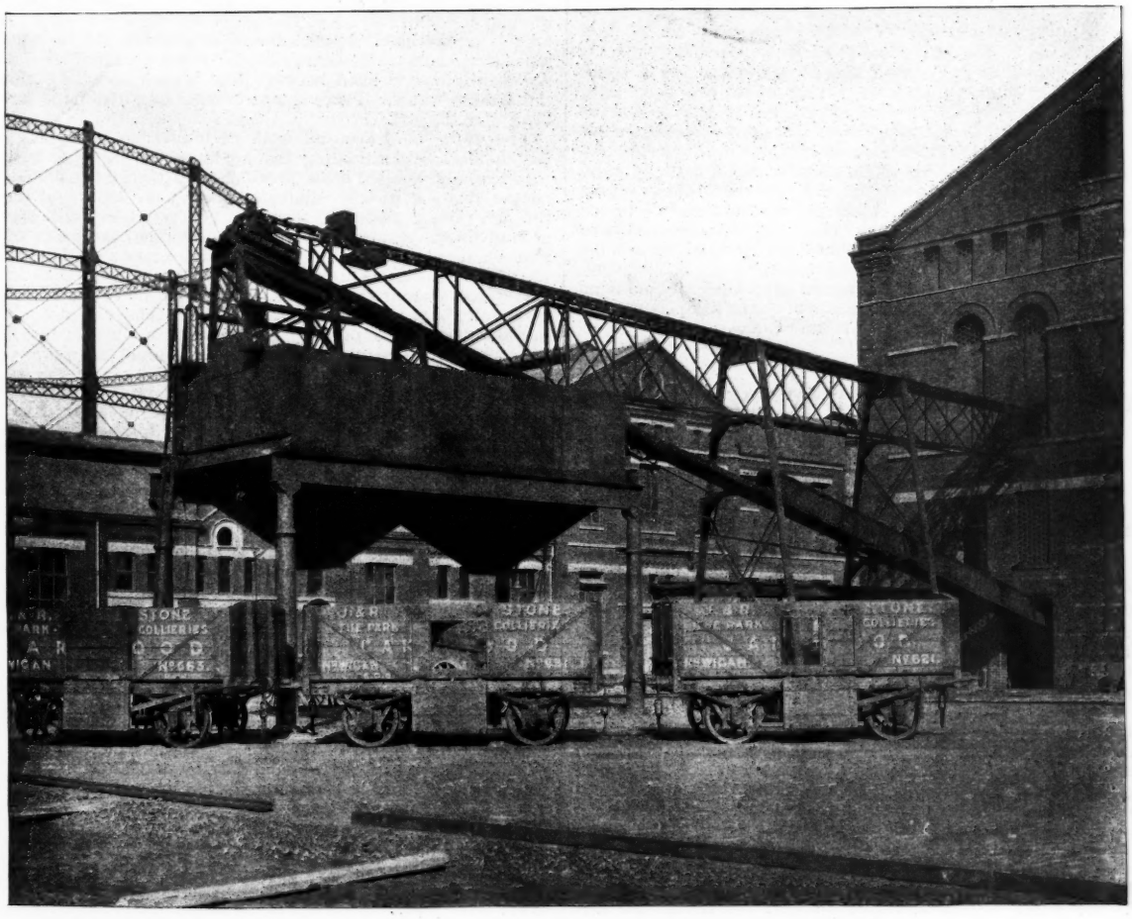
Turning to the purifiers, which were erected by Messrs. R. & J. Dempster, Limited, these are in a stage-floor, and consist of four boxes, each 50 ft. by 35 ft. by 6 ft., with 24-inch connections, Weck's valve, and Green's lids, fitted with two push-plate overhead oxide conveyors and shoots. They have already passed about 100 million cubic feet of gas; there being only two boxes as yet



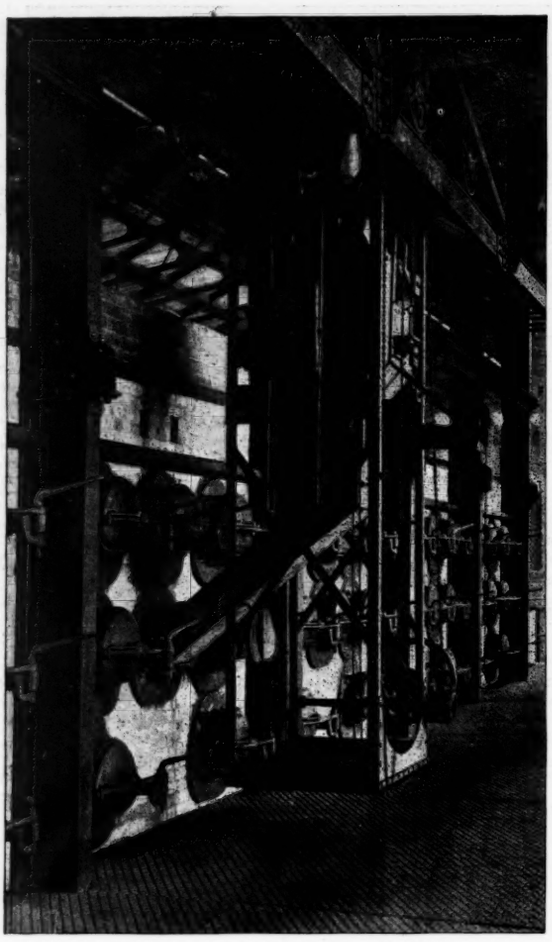
THE BLACKPOOL CORPORATION GAS-WORKS—PLAN OF THE OLD AND NEW STATIONS.



Coal-Hoppers, and the West Push-Plate Conveyor.



Coke Plant and Hoppers with Conveyor.



CHARGING STAGE, SHOWING WEST'S PATENT CHARGING MACHINE.

showing a stain for sulphuretted hydrogen. It was owing to the longevity of the oxide therein that this house was used as a lecture-room in connection with the recent air-ship ascent at Blackpool—a fact which also affords a clear proof of the soundness of the work and the new form of cover-joint adopted.

An inspection of the seven steel annular condensers, 35 ft. by 4 ft. 6 in., by Messrs. Clayton, Son, and Co., the Holmes rotary washer, and the Pelouze and Audouin tar-extractor, by Messrs. Dempster, completed the survey. The party then proceeded to the new laboratory, where Mr. John Chew, jun., explained the various testing appliances in daily use there.

It only remains to say that the works have been erected from the designs, specification, and schedule of quantities prepared by the Engineers, Messrs. John and William Chew.

WATER-SOFTENING PLANT AT THE WILMSLOW (STOCKPORT) WORKS.

By T. MOLYNEUX, of Stockport.

[Extracts from a Paper read before the British Association of Water-Works Engineers, with a Summary of the Discussion.]

At the first annual meeting of the Association, held at Nottingham, the author had the pleasure of describing the borehole and other works which had just been completed for the supply of a part of the district of the Stockport Water-Works Company, whose undertaking was purchased by the Stockport Corporation in 1899. From the commencement, complaints were made not only as to the hardness of the water, but as to a slight discoloration which took place in vessels in which the water was allowed to stand. This was found to be due to a deposit of sesquioxide of iron. The water as delivered at the surface of the borehole was quite bright and clear; but discoloration commenced after standing for about eight hours, and by twenty-four hours was very noticeable. Analytical chemists advise that the deposit is due to the exposure of the water, when the oxygen of the atmosphere breaks up the ferrous hydroxide $Fe(OH_2)$, forming sesquioxide of iron, which is thrown down as a reddish-brown precipitate.

As the water was at this time pumped direct into the distributing-mains, a separate pumping-main was laid, and arrangements made whereby it was pumped into a covered reservoir, and distributed thence by gravitation. This, although slightly reducing the cause of complaint, due to the flow from the reservoir being more steady and continuous than the delivery from the pumps, was by no means entirely successful; and, on the purchase of the undertaking by the Corporation, the District Councils concerned took the matter up, and insisted on the insertion of the following clause in the purchase Bill: "Within two years of the passing of this Act, the Corporation shall effectually soften and clarify the water supplied by them before the same shall be put into their pipes for distribution in the district."

Prior to the purchase, however, the author had been instructed by the Directors of the Company to advise on the best method to be adopted for the softening and clarifying of the water, and had, after visiting various places, decided on the system which he would recommend. Further inquiries were then made by a Sub-Committee of the Corporation Water Committee; and it was finally decided to adopt the Archbutt-Deeley process.

The following is a description of the plant, which has a capacity of 25,000 gallons per hour. The water is delivered from the borehole lift-pump through 12-inch pipes into a cast-iron tank, 75 feet long, 10 feet wide, and 8 feet deep, the bottom of which is 3 inches above the level of the top of the tank in which the process is carried on. The lower tank is cast iron, 75 feet long by 25 feet wide, by 10 ft. 6 in. deep, divided into three by two wrought-iron divisions, making three tanks, which have a working capacity of 32,000 gallons each. Each of these tanks is fed by 12-inch pipes from the first-mentioned tank; the inlet being through the bottom of one side of the tank into about the centre of the tank, where the water is delivered through an elbow lying on its side, so that, when the water is run in, it disturbs the deposit which lies in the tank. From the higher tank and over 6 ft. 6 in. of the lower tank, running the full length, a wooden mixing-house or shed is erected, with an outside platform 2 ft. 6 in. wide. In this house are fixed the lime-mixing cisterns, and all the mechanism for working the plant.

The lime is slaked in cylindrical tanks, 3 ft. 6 in. diameter and 3 ft. 3 in. deep, with a perforated plate fixed a few inches from the bottom to prevent stones or other detritus getting into the suction-pipe, and is boiled by a steam-coil underneath the perforated plate. From the cisterns, it is injected through a series of perforated 2-inch wrought-iron pipes, about 2 feet above the bottom of the tank. There is also a second series of these pipes close to the bottom of the treating-tanks, with perforations on the underside for the injection of air into the water. At each mixing cistern, there is a three-way tap, to which are connected a pipe open to the atmosphere, and a pipe to each row of perforated pipes in the treating-tank for the injection of lime and air. On the upper side of this tap is the outlet for the water when raised for slaking the lime. Higher up still is a branch for the suction-pipes from the mixing-cisterns for the water required for slaking. A 3-inch blower is fixed between this branch and the outlet for the slaking water. There is also a separate steam-pipe for the heating of the coil.

The water is drawn off from each division by means of a rectangular copper floating arm 18 in. by 12 in. by 11 ft. long, with cast-iron hooded head, to which are attached two cylindrical copper floats 2 ft. 9 in. diameter and 15 in. wide, and thence through 12-inch pipes into the small covered reservoir below the ground level. Along the bottom of these pipes are 3-inch baffle-plates, 6 inches apart, which break up the water as it flows out of the tank. The floats are adjusted by means of pet-cocks admitting water, so that the hooded head is buried in the water, and draws off about 1 foot below the surface. There is also a block in the bottom of the tank for the head to rest upon; this being sufficiently high to prevent the lower stratum of water being drawn off. The discharge-pipes are raised by means of chains operated by winches fixed in the mixing-room.

Outside, and at one end of the plant, are fixed two cast-iron stoves, used alternately, and fed with coke, which generate carbonic acid. This is led off by means of 2-inch pipes to a scrubber in the mixing-house. The scrubber is a cast-iron box 3 ft. 6 in. by 3 ft. by 1 ft. 7 in., at the bottom of which are cobbles of limestone to a depth of about 15 inches, and about 2 feet of water. The gas is led into the bottom of this scrubber, where the sulphur and the dust from the gas are removed; and it is then drawn off by means of a blower, and forced through cast-iron pipes into a copper pipe, working on a brass swivel, which runs alongside and enters the head of the discharge-pipe, where it is mixed with the water as it flows from the tank. In addition to these pipes, there is also a 1-inch copper pipe connection to each discharge-pipe outside the tank, to add a further supply of carbonic acid. The carbonating-stoves are made of cast iron, and are 4 feet high and 18 inches diameter, having cones fixed in the upper portion. The coke is fed from the top into these cones, and falls through on to the grates below. The chimney from each stove is taken out from below the cone, and has a lid on top, which is closed or opened as the gas is required or not. The gas is led off from the chimney about half-way up.

Two-inch steam-pipes are laid underground from the boiler-house adjoining, across the yard and from end to end of the mixing-room, to work the blowers and heat the lime mixture. There is a steam-trap fixed at each end of the mixing-house to drain these pipes.

The process is carried on in the following manner: The floating discharge-pipe in the tank to be filled is first raised above the top water-level, the water is then allowed to flow rapidly from the upper tank into the treating-tank to thoroughly disturb the lime which has been deposited from previous treatments, and mix it with the incoming water.

The lime is prepared thus: 48 lbs. (*i.e.*, 1½ lbs. per 1000 gallons) are first weighed out, and put into the mixing-cistern. Water to slake the lime is then lifted by the blower from the tank underneath, or is obtained from the tank forming the back of the house. It is then well stirred, and steam turned on to the coil in the bottom of the cistern, which boils the mixture, after which it is ready for injection into the water to be treated. When about half full, it is forced, by means of the blower (the three-way tap being opened to the suction-pipe, and closed to the air), through the upper row of perforated pipes into the water, which thus becomes agitated as though boiling. Immediately all the lime has gone from the mixing-tank, the valve is closed to the suction-pipe, and opened to the pipe leading to the atmosphere; air being thus blown through the lime-pipes to clear them. These pipes are then shut off, and air is forced through the lower row of pipes, with the underside perforations. This effectually disturbs all the deposit at the bottom of the tank, thoroughly mixing it, as well as the added fresh lime with the water. The agitation is continued from five to ten minutes, according to the quantity of deposit, and is then shut off. The water at this stage will be seen to contain minute particles of lime floating about, and continuously amalgamating into large flakes, which at once commence to precipitate, and within ten minutes the water begins to clear itself perceptibly. It is, however, allowed to stand for about an hour before drawing off. The valve allowing the carbonic acid to pass from the stoves is now opened; and the water is then passed away into the adjoining reservoir, the emptying occupying from fifteen to twenty minutes. The whole time absorbed in thus treating 32,000 gallons, from the time of opening the valve from the upper tank to the emptying of the treated water into the reservoir, is about one-and-a-half hours.

As there are three tanks, it will be seen that, while one is being treated, the second one is clarifying, and the third is being run off. The added lime and that precipitated from the water continuously accumulate at the bottom of the tank; but, when a depth of about 2 feet is reached, the greater part of it is swilled out by means of a hose-pipe through a mudhole and valve at the bottom of the tank to a settling place, where it is allowed to drain—the solid matter which is left being afterwards disposed of. The advantage of injecting carbonic acid is that if, at the expiration of the time allowed for settling, there are any particles of lime left in the water, whether visible or otherwise, they unite with the carbonic acid, and form a soluble carbonate, which is taken up by the water, and does not, as is frequently the case in other processes, settle out in the service reservoir or mains.

The following are analyses of the water both before and after treatment:—

	Untreated.		Treated.
Reaction	Slightly alkaline	..	Slightly alkaline.
Appearance	Cloudy.	..	Clear and bright.
Sulphates	Fairly heavy deposit.	..	Slight deposit only.
	Grains per Gallon.		Grains per Gallon.
Calcium salts	4·16	..	0·70
Magnesium	1·18	..	0·98
Hardness: Temporary	7·59	..	1·35
Hardness: Permanent	5·36	..	4·20
Total	12·95	..	5·55

The cost of the process works out at 1d. per 1000 gallons, made up as follows: Lime, 0·14d.; coke, 0·073d.; wages, 0·285d.; coal, 0·12d.; interest and sinking fund at 5 per cent., 0·25d.; and sundries, 0·1d.—total, 0·968d. The cost of plant capable of treating 600,000 gallons of water per day, was nearly £4500.

The advantages of this system are, in my opinion, many. It is a process over which you have absolute control. A certain quantity of water is treated with a certain quantity of lime for a certain period of time with a certain result. If an error is made during any part of the process, it can immediately be detected and rectified; or, if beyond rectification, the water can be easily separated from the remainder and wasted, if necessary. The plant is very compact compared with others; the area occupied in this case may be said to be 80 ft. by 27 ft. only, as the ground under the upper tank is used for the storage of pipes. The upkeep is small, nothing being required but lime, coke, steam, and one man to look after the plant.

Discussion.

Mr. Molyneux pointed out that the cost quoted for lime was at present excessive. He had not a place to store it, and was situated some distance from where it was obtained. Therefore, at present, the lime came in, as it were, from hand to mouth.

The President (Mr. Frederick Griffith, of Leicester), said that Messrs. Archbutt and Deeley had been very successful in dealing with this process in works, especially along the line of the Midland Railway. The system had been adopted for the water undertaking at Swadlincote; and, he believed, with good results. He was glad to know it had been successfully applied at Stockport. He had every reason to believe that where hard water was the only available supply, it might be considerably improved by adopting such means for softening the water. The Archbutt-Deeley process was, in his opinion, quite comparable with, and for certain waters more suitable than, some of the other processes in use. In many cases, the Porter-Clark process was giving excellent results; but a method suitable for one water was not valuable for all. They were dependent on the chemical constituents of the water to be dealt with; and these varied in different localities.

Mr. W. Whitaker, F.R.S., F.G.S. (Croydon), also felt that the softening process might vary in different localities for different waters. If this particular water was down south, he did not think people would trouble much about softening it. But the strange thing was that this was only a partial supply; and he was curious to know why they wanted to soften it at all, because, he presumed, the other water was a soft one. The answer might be that one water was used for one district, and the other for another. But if this water was mixed with twice its bulk of ordinary water got from a surface supply, the total result would be a fairly soft water. He was glad to hear that some temporary difficulties would be got over, because the cost was rather high—a great deal higher indeed than in some other instances, though perhaps not in cases of so small an amount of water as 600,000 gallons a day. He believed that at Southampton, Mr. Matthews had reduced the cost to something like ¼d. or ⅓d. per 1000 gallons. He could not speak positively as to the figure; but he had reduced the cost of softening largely of late, and had simplified the process. By his improvements, he had greater and more automatic control than before. Then, as to the area occupied, this was an important matter; and it showed the great advantage of a process of this kind over the crude Porter-Clark process, in which large tanks had to be used. The water dealt with at Southampton would be about five times as much as in the case before them; and the area of the land was about the same in proportion—not more than five times as great. For efficiency and cheapness, it was important to adopt a process that did not take up much land.

Mr. J. W. M. Richardson (Birkenhead) had been making inquiries recently for softening plant; but he had only got approximate estimates up to the present time. The plant was required to treat water of about 25° of total hardness; and the prices ran from about £8000 up to £11,000. The quantity of water to be dealt with was about 50,000 gallons per hour; and by certain plant it would be reduced to about 5°, and by other forms to about 12°. The working cost, so far as he could ascertain, varied from about ¼d. to 1¼d. per 1000 gallons. These figures showed large variations in the processes.

Mr. G. Greenslade (South Hants Water Company) also failed to understand why Mr. Molyneux softened this water. In his own case, he was prepared to deliver water of 7° or 8° of hardness. Originally it was 19° in one district, and 14° in another. Perhaps the reason was that the author had something else that he desired to take out of the water. He had visited the works at Swadlincote; and there they had a very difficult water to deal with. But it came out very well. In addition to the lime which was added to the water, they also used (he thought it was) common soda; but that was to remove the iron in the water, or something of the sort. He should like to ask if the author found this system left the water perfectly clear. In his (Mr. Greenslade's) case, the only object they had, in adopting a softening process, was to soften the water, and leave it perfectly clear; there was nothing that required to be removed further than the hardness. With Mr. Whitaker, he thought that one of these processes was much better than the old-fashioned Porter-Clark process, especially where they were tightly pressed for room. He had the original Porter-Clark system at work, and was now about to put down a plant similar to the one Mr. Matthews had at Otterbourne—that was, the Atkins system—because it took up far less room, and was more economical. He did not know what their softening cost his Company; but he had an idea it was something like 1d. per 1000 gallons. Mr. Matthews's cost was much less; but then he dealt with large quantities of water. He softened 3 or 4 million gallons per twenty-four hours.

Mr. F. J. Bancroft (Hull) remarked that it also appeared to him to be absolute waste of money to doctor the water referred to in the paper in the way described. He could not understand what it was being done for. It was well known that hard water was far better than soft. The late Mr. Thomas Hawksley, in preparing some statistics for a Royal Commission, got out the death-rate for a number of towns; and, in the case of those supplied with soft water, the death-rate was about 1·4 per cent. greater than in those that had a hard water supply. Certainly, in a case of this sort, where the grains per gallon and the hardness were very moderate, the water might very well have been distributed without treatment.

Mr. C. E. Jones (Leyton) pointed out that the chief recommendation of the process was that it required such a small space in which to operate it; but he agreed that, in the author's case, the hardness was not at all excessive, and the grains of solid matter to the gallon were small. Unless there was some other object, or some other substance to be removed, it did seem to be a work of supererogation to treat this water. But it appeared to him the iron was the objectionable matter; and, in order to get rid of it, they subjected it to this complicated system of treatment. He should like to ask the author whether he had tried aëration and subsidence. Because, if iron was the only thing to

be removed, exposure of the water to atmospheric oxygen, and subsequent subsidence, would effectively remove the iron.

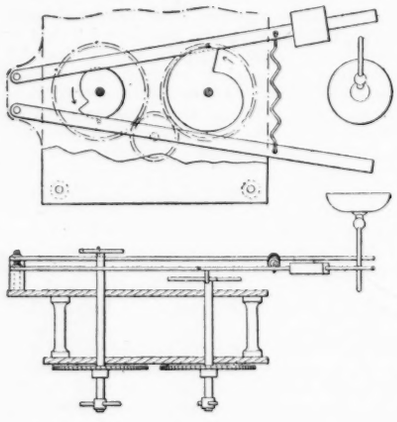
Mr. MOLYNEUX, in reply, said that Mr. Whitaker suggested they should mix their waters. At the first glance, this seemed right. But it would mean special plant for the purpose of mixing—special plant to pump the water to the soft water, or special means to bring the soft water to the hard water; and then the total quantity would have to be pumped again. The whole thing was looked at from many points of view; and this was certainly the cheapest way out of the difficulty, and, in the end, the most satisfactory. Another thing was they had trades in the town (such as hatters and dyers) which required soft water—not a medium water, not a 14° or 9° water. They gave them a 2° water (the Manchester water) and a 5° water from their own gathering-ground. If they mixed the water referred to in the paper (seeing that it had iron in it as well) with their soft water, they would simply spoil the lot, and gain no benefit. Several speakers wanted to know why the water was being treated at all. In the first place, they were made to treat it by the District Councils, who opposed the Corporation when in Parliament, and would have gone on opposing, if the Corporation had not agreed to put in the clause quoted in the paper. It was the discoloration no doubt that caused the District Councils to take action; and they also grumbled about the hard water. The gentlemen who opposed went to their businesses in Manchester, and used water of 2° hardness; and then, when they went home to harder water, the difference was accentuated. Mr. Jones had suggested aëration and subsidence. What would that have cost? The discoloration did not start for eight hours, and it did not finish at the end of twenty-four hours, nor at the end of seven days. The aëration would make a difference to it no doubt; but to aërate it, he took it they would have to use mechanical means. The ordinary method of exposing the water in a reservoir to the atmosphere would not do it. As to Mr. Greenslade's inquiry, whether the water after treatment was perfectly clear, it was absolutely so.

REGISTER OF PATENTS.

Automatically Turning Gas or Water Off.—Stockall, J. J., of Clerkenwell Road, E.C. No. 23,030; Nov. 14, 1901.

This apparatus is actuated by an ordinary clock movement for automatically cutting off the supply of gas, water, and the like, and for automatically renewing the supply at pre-arranged intervals of time.

The device is capable of attachment to the movement of an ordinary clock, and of being actuated by such movement. It is so arranged that a rod, fixed to an ordinary gas or water tap, may be so operated thereby as to control the supply by attaching two spindles each carrying an adjustable snail or other cam to the frame of the clock movement. The spindles are also provided with cog-wheels fast (or friction-tight) thereon, in gear with one of the cog-wheels of the clock movement. Two arms or levers are pivoted to part of the clock-frame—one lever for each cam; and each lever is provided with a pin or projection, capable of engagement with its cam. The other lever has a spring or weight for the purpose of causing it to rise when



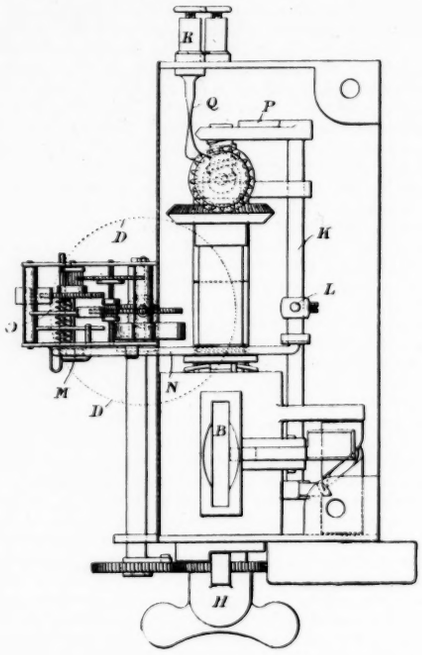
released by the cam. The levers are so pivoted that their extremities are capable of coming in contact with the rod fixed to the tap, so that when the weighted lever is released by its cam it falls and strikes the rod, and forces it downwards, opening the tap. And when the spring-controlled lever is released by its cam, it springs upwards, striking the rod on the under side, and forcing it upwards to its original position. The cams are adjustable in order that the supply of gas or water may be intermittently turned on or cut off at pre-arranged regular or irregular intervals, automatically, without any further attention after the mechanism has been set, except to wind the clock.

The illustration shows an elevation of the general arrangement employed—the ordinary clockwork portion being omitted in order to more clearly exhibit the construction; also a plan of same showing the frame of the ordinary clockwork.

Alarm Device for Coin-Freed Gas-Meters.—Gilgan, P., and Browne, F., of Sligo. No. 5486; March 5, 1902.

The patentees claim the combination with a coin-freed gas-meter of clockwork mechanism which is wound up on the insertion of the coin or coins, and is arranged to actuate an alarm bell on its release by a lever arm, or other device, operated by the meter, so as to ring the alarm prior to the gas supply being cut off.

Within the casing of the meter, into which the coin is inserted at the slot B, clockwork mechanism is fitted such as is provided in an alarm clock to act upon the bell D, under the action of a main spring, when the hammer is released from a stop-pin provided for the purpose of preventing the hammer striking the bell until the proper time. The main spring is so connected by gear wheels with the handle H of the meter, that the spring is wound by the action of turning the handle after a coin has been inserted to permit of a predetermined quantity of gas passing through to be consumed.



The winding of the main spring for actuating the bell-hammer is effected by mechanism which throws the alarm mechanism out of action with the main-spring axle after the first coin has been inserted in the meter, or (as shown) by mechanism which imparts a certain amount of winding to the spring with the insertion of every coin. In the latter case, the bell—after the hammer is freed—rings for a long period; in the former case, there would only be a short ring. Thus, as the winding mechanism is thrown out of gear with the main-spring axle after the first coin has passed through the meter, all danger of breaking the spring due to the insertion of a large number of coins in the meter is prevented; and as the bell rings, the winding mechanism is again connected to the main spring axle, and is ready to be wound at the insertion of the next coin.

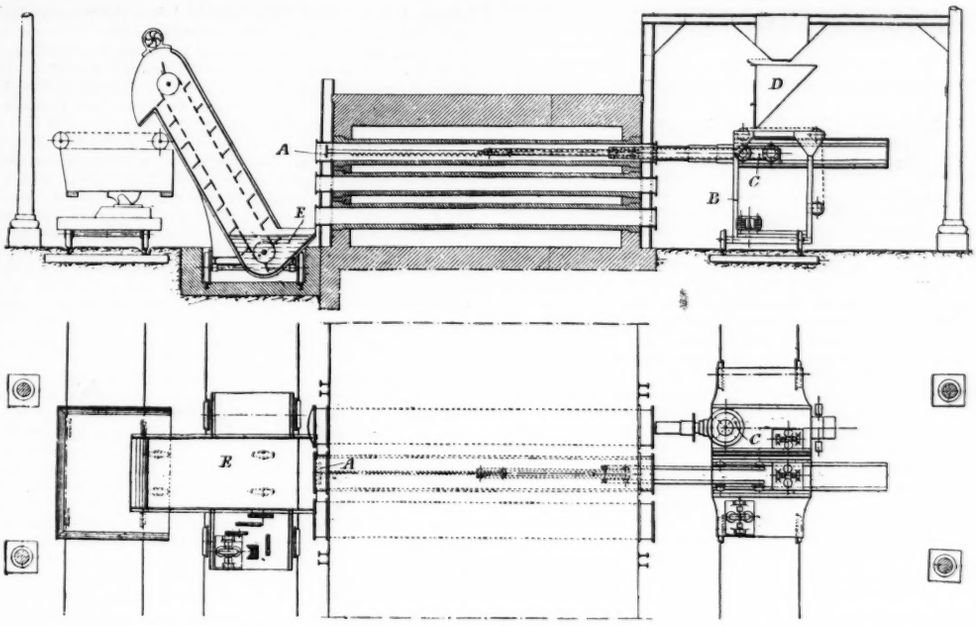
The opening and shutting of the gas-valve of the meter may be effected under action of the gas being consumed by a sliding-rod K or screw, or the like; and this opening and shutting mechanism is so arranged that the lever-arm L or other projection upon the rod K comes through the intervention of a lever-arm M on the rod N into contact with the stop-pin of the bell-hammer, and frees the hammer against the action of the spring O shortly before the supply of gas which has been prepaid for in the meter is exhausted—the lever-arm L or projection being moved away from the stop-pin by the insertion of another coin.

If the meter is fixed at a distance from the point where the gas is being consumed, the arm P on the sliding rod K (when the latter has travelled to near the end of its stroke) makes, and then breaks, contact with the contact-piece Q connected to the insulated terminal R, so that one electric bell fixed near the point of combustion will ring before the gas goes out, and the current of the battery is not wasted in case a coin be not inserted in the meter.

Working Gas-Retorts.—Wise, W. L.; a communication from the Compagnie Parisienne d'Eclairage et de Chauffage par le Gaz. No. 852; Jan. 11, 1902.

This invention relates to the working of horizontal or approximately horizontal gas-retorts by mechanical apparatus which enables the coal and coke to be moved always in the same direction. For this purpose, there is provided a combination of mechanical apparatus adapted for simultaneously discharging a retort, quenching and conveying away the coke, and charging another retort. One example of such apparatus (in vertical section and plan) is shown—in the positions the respective portions occupy at the moment when the discharging apparatus has discharged the coke from one of the retorts, while the charging apparatus in advance of the discharging apparatus is ready to charge a retort.

The discharging and charging plants are mounted side by side at (say) the right-hand end of the retorts, on a single frame carried by



wheels to run on rails. When the piston A of the discharging apparatus has left the retort, during its return towards its frame B, the charging apparatus comes into action and distributes the charge of coal in the corresponding retort. During this time, the quenching apparatus, and an elevator for conveying the quenched coke, effect the quenching and conveying away of the coke on the stage at the left-hand end of the retorts.

The constituent parts of the apparatus may be variously constructed. The charging apparatus may be of any suitable type; but the patentees prefer it to comprise a centrifugal distributor C, the speed of which can be varied so that the coal supplied to it by a measuring hopper D is projected first to the back of the retort; and as the speed of the rotary distributor diminishes, the distance to which the coal is projected diminishes in such a manner that the charge is uniformly distributed throughout the entire length of the retort. To obtain this result, the distributor may be rotated by an electric motor, in the circuit of which are interposed resistances which gradually increase from the beginning to the end of the operation. This charging apparatus is the subject of a separate patent—No. 791 of 1902 (the specification of which is not yet issued).

The discharging apparatus may likewise be of any suitable type. The piston of it may be moved by a beam composed of three parts, adapted to slide one within another telescopically, so that the apparatus will require little space. The movement of the piston may be effected by any suitable mechanism, such as that described in patent No. 368 of 1902 (see "JOURNAL" for Dec. 16, p. 1630).

The details of the quenching apparatus E, and the apparatus for conveying away the quenched coke, may be also varied; but those shown are the ones described in patent No. 586 of 1902 (see "JOURNAL" for Dec. 16, p. 1631).

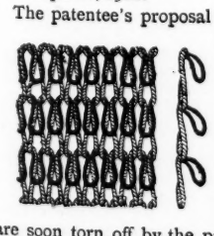
Mixing Air and Gas or Other Fluids.—Loeben, G. A., of Philadelphia, U.S.A. No. 12,710; June 3, 1902.

The object of this invention is to provide means whereby a flow of gas under pressure is caused to compress air for admixture with it; the apparatus providing for the admixture of air and gas in any desired relative volumes for use in connection with gas-burners, gas-engines, or for other uses where mixtures of air and gas are required.

Where one of the fluids is under pressure and the other is not, the apparatus comprises a closed casing containing chambers for the two fluids, separated by a moveable diaphragm, and a valved inlet and outlet for the two fluids. The valve mechanism which governs the flow of fluid under pressure is operated by a moving diaphragm of small area constituting part of the partition between the two chambers which receive fluid under pressure. It is connected to the larger diaphragms which are acted upon by the fluid under pressure, so that each chamber operates in conjunction with two independent chambers for receiving the fluid which is not under pressure.

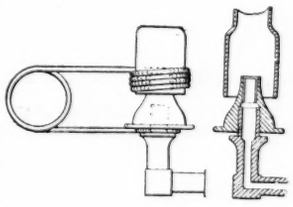
Incandescent Gas-Mantles.—Offenberg, M., of Berlin. No. 20,242; Sept. 16, 1902.

The patentee's proposal is to provide over the ground webbing of the mantle projecting threads, loops, or the like, firmly connected to the mantle as shown. By this arrangement of the threads or loops, it is claimed that a much better effect will be obtained, as the incandescent surface is enlarged without a greater quantity of gas being necessary. Attempts have been made (the patentee points out) to attain a better effect in incandescent mantles by arranging loose rings in the meshes of the webbing; but these rings are soon torn off by the pressure of the gas thereby destroying the incandescent surface of the mantle.



Combined Anti-Vibrator and Gas-Feeding Device for Burners Carrying Incandescent Mantles.—Marshall, C., of Fitzroy, Victoria. No. 19,664; Sept. 8, 1902.

This invention consists in mounting the gas-feeding tube carrying the burner, mantle, &c., on a wire spring-bow (projecting when in position at right angles to the feed-pipe) by inserting the base end (enlarged) of the feed-pipe in a receiver or socket on the upper arm of the spring-bow—such receiving socket being formed "of a plurality of parallel rings or coils turned in." At the end of the arm, the lower parallel arm of the bow is attached to a threaded tubular nipple connecting with the gas-supply pipe; the upper short-threaded projection of the nipple mounting a small cone-shaped nozzle with flattened finely perforated top, so arranged that the feed-pipe, burner, connections chimney, and mantle are wholly supported by, and are free to move integral with the vibratory motion of, the upper arm of the spring-bow. While the enlarged base of the feed-pipe is open and unattached, its terminal periphery lies midway between the parallel arms of the spring-bow, and so that the conical tubular nozzle projects centrally within the interior of the base of the feed-pipe. In this way, the gas passing through the fine perforations at the apex of the nozzle feeds well up into the feed-pipe; the gas passing thence through the feed-pipe up to the burner. A space of $\frac{1}{32}$ inch between the base of the conical nozzle and the annular edge of the feed-pipe admits air freely to mingle with the gas.



APPLICATIONS FOR LETTERS PATENT.

26,989.—FITZSIMMONS, W., "Application of gas to the lighting of fires." Dec. 8.

26,995.—EDMUNDSON, J., "Gas-lighters." Dec. 8.

27,014.—HALL, J. G., "Furnaces for gas and other fuel." Dec. 8.

27,070.—BALLANTYNE, J., "Discharger for sulphate of ammonia saturators." Dec. 8.

27,123.—SCHWEHM, P., "Internal combustion engines." Dec. 9.

27,199.—BROOKS, H., and SIMPSON, S., "Preventing shocks to incandescent gas-mantles." Dec. 10.

27,222.—HOLMAN, S., "Gas-burners." Dec. 10.

27,225.—BAKER, A. S., "Internal combustion engines." Dec. 10.

27,242.—HENWOOD, J. H., "High-pressure incandescent gas-burner." Dec. 10.

27,299.—MICKLEWOOD, E. H., "Internal combustion engines." Dec. 11.

27,314.—BATES, I., "Anti-vibration incandescent gas-burners." Dec. 11.

27,319.—GEEKIE, J., and ROBB, D., "Incandescent burners." Dec. 11.

27,335.—MOELLER, J., "Incandescent gas-burners." Dec. 11.

27,336.—MOELLER, J., "Anti-vibrator for incandescent gas-burners." Dec. 11.

27,337.—MOELLER, J., "Bye-pass tap for street-lanterns." Dec. 11.

27,393.—TEE, H., "Gas-fires." Dec. 12.

27,416.—GRICE, G., and DEWEY, H., "Intensifying the illumination of incandescent mantles." Dec. 12.

27,467.—HENNINGES, E., WUNTSCH, F., and HOLY, E., "Incandescent lighting and heating." Dec. 12.

27,482.—BODART, A. T., "Gas-igniters adapted to be operated from a distance." Dec. 12.

27,520.—SCOTT, E. F., "Gas-producers." Dec. 13.

27,533.—LA COMPAGNIE DU GAZ H. RICHÉ, "Manufactnre of com pound producer gas." Dec. 13.

CORRESPONDENCE.

[We are not responsible for opinions expressed by correspondents.]

Inclined v. Horizontal Retorts.

SIR,—Mr. West is reported in last week's "JOURNAL" to have said that horizontal retorts with his machinery had been worked as economically as—in fact, more economically and more efficiently than—any other system; and to prove this, he quotes Bury as carbonizing at 1s. 1½d. per ton of coal. Mr. West, however, does not seem to be aware, or to have realized, what are the possibilities with inclined retorts, particularly if the men employed in working them are kept more fully engaged, as he says they ought to be on horizontals to enable better results to be got by the use of his machine.

Much better results than the case quoted by Mr. West are being obtained at these works by means of inclined retorts fitted up in combination with Messrs. R. Dempster and Sons' patent hot-coke conveyor. From July 1 last to Dec. 13, we have carbonized with the inclined retort installation 4892 tons of coal, and paid during the same period a total of £198 in wages for doing so. This sum runs out to slightly under 9¾d. per ton of coal carbonized, and includes the following items: (1) Getting coal into the retort-house. (2) Drawing and charging men. (3) Furnaces. (4) Getting coke into the yard and stacking. (5) Pipe-jumpers (when necessary). (6) Exhauster and boiler men. (7) Attention to conveying and elevating plant. (8) Refreshments (or allowances). In fact, it includes everything that could be put down against carbonizing, except myself and the yard foreman.

During this period we have been working from two to five beds of inclined settings of eight retorts. The carbonizing cost would have been still less if the Contractors' men had not been in our way during part of this period, finishing the last of the arches, or if our gasholder storage was not deficient; and we certainly should have done better if our works were producing a larger annual make. I should like to know what the Bury figure is for the same period, or over the twelve months, and to include all items mentioned above.

Our experience firmly convinces me that inclined retorts have not only come to stay, but that they really are the best system of carbonizing coal, and suitable for the great majority of medium-sized gas-works in this country. Please also allow me to state that our hot-coke conveyor, which has no wearing parts in the trough or among the coke, has now been working twelve months without requiring any repairs; and, judging from appearances, it will go many years yet before requiring to have any money spent upon it.

Heckmondwike, Dec. 19, 1902. A. F. GOODSON.

PARLIAMENTARY INTELLIGENCE.

HOUSE OF LORDS.

Monday, Dec. 15.

LONDON WATER BILL.

To-day the House considered this Bill in Committee—Lord MORLEY in the chair.

On clause 1, dealing with the establishment of the Water Board,

Viscount HAMPDEN (the Chairman of the Lambeth Water Company) moved to leave out sub-section 3, which provides for the constitution of the Board, in order to insert an amendment containing a scheme for one of 33 members, besides the Chairman and the Vice-Chairman, and allotting 14 to the London County Council, two each to the City, Essex, and West Ham, three to Kent, four to Middlesex, three to Surrey, and one each to Hertfordshire, the Thames Conservancy, and the Lea Conservancy. He said the Board, as constituted under the Bill, was too large to secure the advantages which ought to be derived from a transfer thereto of the undertakings of the Water Companies. He criticized the proposals embodied in the Bill, and condemned them as being directly against the evidence given before the Llandaff Commission. He also commented strongly upon the action of the Government in nominating the noble Lord who presided over the Joint Committee to whom the Bill was referred, and upon their proceedings on the question of the constitution of the Board. He reminded the House that Lord Llandaff's Commission reported that no preponderance should be given to any conflicting interests. By including the Borough Councils, conflicting interests were created, not between London and the other districts, but between different parts of London. Could they, he asked, expect effective administration from a Board so constituted? It was too large, and there would be no continuity of policy. He believed a Committee of the London County Council would do the work admirably. What was wanted was a small, compact, experienced body, promising unity of management. Instead of this, the Government had appointed a large Board having the certainty of conflicting interests. The Council had experienced officials; they had studied the water question thoroughly; and he thought they ought to have the dominant voice in this matter.

Lord BALFOUR said he had no reason to complain of the tone in which the noble Lord had moved his amendment; but he was unable to agree with the majority of his arguments. If they only criticized the proposed Board on account of its size and the divergent views it might possibly represent, no doubt a *prima facie* case could be made against the proposals in the Bill. But when they came to consider other proposals which had been put forward, including the noble Lord's, they saw that their disadvantages were greater than those of the Government's scheme, which was to give representation to the six County Councils in the area known as Water London. In addition to this, they gave representation to the county borough of West Ham and all the other boroughs and urban districts within the area. The proposal of the noble Lord was to delete the representatives from the Metropolitan Boroughs, the non-county boroughs outside the Metropolis, and the urban districts, and to take a County Council basis. He said the London area must have a dominant majority; but his scheme did not give it. It gave 16 out of 33—14 to the London County Council and two to the City. London ought to have a majority, and must have one on the Board; and the only way to bring this about was to take into the representation those other bodies whose introduction was so much condemned. No doubt there was a desire that the London County Council should be the Water Authority. There was nothing surprising in that. But he felt bound to point out that the Council stood alone in desiring it. An essential part of the scheme was that representation should be given to other authorities as well as to the Council; and the outside authorities, he wished to remind the Committee, would not consent to the Council having a preponderating majority on the Board. To accept the suggestion which had been made would be fatal to the Bill. The proposal of the Government had been accepted by all the authorities except the Council, and he did not think their Lordships would regard this as a reason for rejecting the Bill.

Lord TWEEDMOUTH said it was represented that the proposal of the Government had been accepted by all the authorities concerned. But this was not true of the authority which most represented London—viz., the London County Council; and there were no fewer than nine of the Borough Councils who had passed resolutions against the proposed Board. The Bill provided for 62 members representing no less than 78 different authorities, which, to a large extent, overlapped each other. His noble friend's proposal provided for 33 members representing eight separate authorities, which covered the whole ground and did not overlap. This plan would secure the representation on the Board of those authorities only which were likely to look upon the supply of London water from a general point of view. He was opposed to giving an absolute majority to the representatives of the Borough Councils and of Urban District Councils—to the very men who were least capable of dealing with the subject in a large manner. These people would regard the Water Question as it affected their own districts, instead of looking at it as one which concerned London as a whole.

The House divided on the question that the sub-section proposed to be omitted should stand part of the clause; and it was carried by a majority of 36.

Earl CARRINGTON submitted an amendment to provide that the Board should consist of 42 members, besides the Chairman and Vice-Chairman. He said the County Council did not want the dominant power on the Board, but they wanted the dominant voice. Under his amendment and subsequent amendments, he proposed to divide London, for the purposes of representation on the Board, into the City and 15 groups of boroughs, and also to give proper representation to the outside districts.

Lord BALFOUR said the grouping together of the Metropolitan Boroughs was strongly objected to by the boroughs themselves, and the proposed scheme would displease everybody.

The amendment was by leave withdrawn.

Earl STANHOPE moved an amendment to provide that there should be one member on the Water Board representing the Councils of the urban districts of Beckenham, Bromley, and Chislehurst, and one member representing the Councils of the urban districts of Penge, Bexley, Dartford, Erith, and Foots Cray, instead of one member representing all these urban districts. He urged the necessity of this provision, on account of the depletion of the water supplies of Kent in order to supply South London. He contended that Kent had not been so fairly treated as other areas.

Lord BALFOUR said he could not accept the amendment. The question had been raised before the Joint Committee, and it was held over for future settlement and arrangement.

The amendment was withdrawn, and clause 1 was added to the Bill.

On clause 2, dealing with the transfer to the Board of the Water Companies' undertakings,

Lord WELBY moved an amendment providing that the Board shall pay to each Company as compensation for the transfer of their undertakings such sum as might be agreed upon between the "London County Council on behalf of the" Board and the Company.

Lord BALFOUR remarked that the Board could not be put in leading-strings to another body representing a smaller constituency. If the Bill had stood as it left the Joint Committee, there might be some ground for the noble Lord's apprehension; but a clause had been inserted providing that the agreement could not take effect until it had received the assent of the Arbitrators.

The amendment was negatived.

Clause 2 was then ordered to stand part of the Bill, as were also clauses 3 to 6.

On clause 7, providing for the substitution of water stock for irredeemable debenture stock,

Lord WELBY moved an amendment to provide that the amount of water stock issued to a debenture holder should be such an amount "as, in the opinion of the Arbitrators, will be equivalent in value to an equally good security producing the same income." He said that under the clause as it stood a great benefit would be conferred on the debenture holder. He thought the price ought to be settled by an independent arbitrator.

Lord BALFOUR pointed out that the clause only dealt with irredeemable stock. He did not deny that, in certain circumstances, the holders of irredeemable stock might, under the clause, get a certain bonus. The noble Lord, however, assumed that the water stock must be issued at par. He believed this was not necessarily the case. If there was a small rise in the capital value of the stock, it would not be more than would compensate the holders for having to take a redeemable in place of an irredeemable stock.

The Committee divided; and the amendment was rejected by a majority of 37.

Lord BALFOUR proposed the insertion of a new sub-section in clause 7, providing that the stock substituted for any irredeemable debenture stock should be held in the same rights, on the same trusts, and subject to the same powers, provisions, charges, and liabilities

as the debenture stock before the substitution, and so as to give effect to, and not to revoke, any testamentary or other dispositions affecting the stock.

Lord COLERIDGE drew attention to the expression "in the same rights," and asked whether it applied to the New River shares, because, if it did, it would confer upon the holders of the new stock the franchise which was now enjoyed by the holders of the shares.

Lord BALFOUR said the section would not apply to the shares in the New River Company. He added that the question of the remaining rights of the Company was exceedingly complicated, and the Government had endeavoured to get rid of the difficulties, especially in regard to the franchise. He hoped shortly to be in a position to convince the noble Lord that he had met the particular point which he had raised.

The amendment was agreed to, and the clause, as amended, was added to the Bill, as were also clauses 8 to 36. Amendments were made in clauses between 37 and 53, and these were added to the Bill.

The Committee now reached the schedules, the first and second of which were passed. On the third, dealing with the constitution and proceedings of the Board,

Lord TWEEDMOUTH moved an amendment to provide that any person should be disqualified for appointment unless he was a member of the constituent body appointing him.

Lord BALFOUR said he thought it was unlikely that a county council would appoint anybody who was not a member of their own body; but it was desirable that the appointing bodies outside the Metropolis should choose whom they pleased. He was, however, willing to put in an amendment to provide that, if a constituent body chose one of their own body, and that gentleman ceased to belong to it, he should no longer remain upon the Board. It would be an advantage to the outside bodies to be able to appoint experts who would have weight on the Board.

Lord TWEEDMOUTH said he thought it would be found in many cases that the Borough Councils would appoint their Clerks to represent them.

The House divided, when the amendment was rejected by a majority of 29.

An attempt was then made to reduce the term of office of the Chairman and Vice-Chairman of the Board to one year; but the proposal was rejected by a majority of 28.

Some drafting amendments having been agreed to, the remaining schedules were passed; and the Bill, as amended, was reported.

Tuesday, Dec. 16.

To-day the House considered the Bill in Committee.

A number of drafting amendments having been agreed to,

Lord BALFOUR moved to leave out the latter part of sub-section 6 of clause 9, dealing with the transfer of the undertaking of the New River Company to the Water Board, in order to insert the following words as a new sub-section:—

7. Every adventurer's share and every King's share, and every part of an adventurer's or King's share, and any water stock issuable or issued in respect of any such share or part of a share, and the right to receive any such water stock shall (1) until the appointed day, and (2) after the appointed day, but thereafter only unless or until (*a*) some person who *sui juris* is absolutely entitled beneficially in possession to, or has a general power to dispose of, such share or part of a share, or such water stock, or (*b*) such share or part of a share, or such water stock or the right to receive such water stock, is transferred on a sale to a purchaser, for all purposes of disposition, transmission, and devolution, be considered as land, and (so far as regards such water stock or right to receive water stock) be held for and go to the same persons, in the same manner, and for and on the same estates, interests, and trusts, as the adventurer's or King's share, or the part of an adventurer's or King's share, in respect of which the water stock is issuable or issued, would have been held and have gone under any will, settlement, or other instrument affecting that share or part of a share, or otherwise, if this Act had not been passed. For the purposes of this provision, the expression "general power" includes every power or authority enabling the donee or other holder thereof to appoint or dispose of the fee simple or absolute interest of or in property in possession as he thinks fit, but exclusively of any power exercisable in a fiduciary capacity or exercisable as tenant for life under the Settled Land Acts, 1882 to 1890, or as mortgagee.

He explained that the New River Company was different from all other Companies in that the property was vested in the owners of the adventurers' and King's shares, and that the Company only administered the property for the owners. The transfer of the undertaking would convert property which was now realty into personalty, and that change would work hardship in certain possible cases. The clause as originally introduced proposed that the shares and water stock issued should be treated as land; but it had been objected that this form of clause would impress the character of real property on the stock for all time. The object of the amendment was to limit the time during which the stock should hold that character; and the limit proposed was the appointed day, and such time afterwards as elapsed before the property passed naturally into the hands of someone who was entitled to dispose of it. There could be no doubt as to the franchise question being covered by the clause.

Lord COLERIDGE said the new clause entirely met all objections, and, while saving existing rights, prevented the infinite multiplication of this franchise in future.

The amendment was agreed to, as were also a number of further drafting amendments.

Lord BALFOUR moved to insert in clause 43 ("Payment of Dividends to Companies till Discharge of Compensation") the following new sub-section:—

If the amount payable in any year under this section to any Company exceeds the amount which, by reason of any limitation on the dividend of that Company, would have been distributable as dividend if this Act had not been passed, the excess shall not be paid to the Company.

He said the object of the amendment was to meet the case of the Kent Company, the proprietors of which had the right, if the maximum dividend was not paid in any year, to have the arrears made up in subsequent years. The amendment provided that the proprietors should not receive more than 7½ per cent. on the capital between the appointed day and the date of satisfaction.

The amendment was agreed to.

Drafting amendments to clauses 45 and 47 and to the second schedule were also agreed to.

On the third schedule ("Constitution and Proceedings of Water Board"),

Lord COLERIDGE proposed to amend section 3 in order to provide that a Director of a Metropolitan Water Company or a shareholder, being himself beneficially interested in the share or shares standing in his name, shall, until the compensation payable to the Company is determined, be disqualified from being appointed or being a member of the Water Board. He said it seemed to him that the persons who were to enter into this contract should be without beneficial interest in it on one side or the other.

Lord BALFOUR said he agreed generally that it was not right that people on public boards should deal with matters in which they had a private interest. The section disqualified a Director, and the noble Lord sought to disqualify the shareholders also. This amendment was unnecessary, because sub section (*c*) of section 2 provided that a shareholder in any Company should not vote at any meeting of the Board on any question in which such Company was interested.

The amendment was withdrawn.

The Bill was then read a third time and passed, amid cheers. The Lords' amendments were sanctioned by the Commons next day, and the Bill was returned to the Upper House.

GAS AND WATER ORDERS OF LAST SESSION.

The report of the Board of Trade on their proceedings under the Gas and Water Works Facilities Act, 1870, during the session just closed was issued on Friday. It states that in December, 1901, twenty-six applications for Provisional Orders were made to the Board—thirteen of them relating to gas, ten to water, and three to combined gas and water undertakings. The amount of capital proposed to be authorized was £695,000 by shares and £220,164 by loan; of which £417,000 share and £136,082 loan capital was for gas, and £258,000 share and £79,082 loan capital for water purposes. The remainder—viz., £20,000 share and £5000 loan capital—was required for gas and water purposes combined.

The applications for the Gas Orders were in regard to Bothwell and Uddingston, Bridge-of-Earn, Chapel-en-le-Frith, Cirencester, Clay Cross, Garw and Ogmore, Harwich, Hornsey, Rothwell, Skegness, Staines and Egham, Syston and Thurmaston, and Wellingborough. Eight applications—viz., those relating to Chapel-en-le-Frith, Cirencester, Garw and Ogmore, Harwich, Hornsey, Rothwell, Staines and Egham, and Wellingborough—were in respect of undertakings already authorized by Special Acts or Provisional Orders, and sought the following powers: To extend the limits of supply defined by the Chapel-en-le-Frith Gas Order, 1876, to authorize William Walker to maintain and continue the existing, and to construct additional, works, and for other purposes; to empower the Cirencester Gas Company, Limited, to raise additional capital; to confer on the Garw and Ogmore Gas Company amended borrowing powers; to empower the Harwich Gas and Coke Company to raise further capital, construct additional works, &c.; to authorize the Hornsey Gas Company to raise more capital, to purchase lands, and construct additional works; to empower the Rothwell Gaslight Company to raise additional capital; to enable the Staines and Egham District Gas and Coke Company, Limited, to purchase lands, to construct more works, and to raise capital; and to authorize the Wellingborough Gaslight Company, Limited, to acquire lands, construct additional works, &c. Five applications—viz., those relating to Bothwell and Uddingston, Bridge-of-Earn, Clay Cross, Skegness, and Syston and Thurmaston—related to unauthorized gas undertakings, and were for power to maintain and continue existing gas-works and to manufacture and supply gas. Objections were lodged against several applications and they were fully considered by the Board of Trade—inquiries being held in such cases as appeared to be necessary. The application by the proprietor of the Chapel-en-le-Frith gas undertaking was withdrawn; but in each of the remaining instances an Order was granted, subject to certain modifications and amendments. Inquiries were held in regard to five applications. The first related to Bothwell and Uddingston; the applicants being the Bothwell and Uddingston Gas Company, Limited, who desired power to maintain, continue, and construct gas-works on an existing site, and to manufacture and supply gas within part of the parish of Bothwell, in the county of Lanark. The promoters failed to obtain the consent of the Parish Council; but it appeared that the consent of the Lanarkshire County Council and the Middle Ward District Committee had been given, and that those Authorities were desirous that the Order should be granted. The consent of the Parish Council was withheld for the reason that they considered it undesirable that statutory powers should be granted to a private company. The Board, however, did not think that there was any ground for refusing to grant the promoters the powers asked for; and they decided to dispense with the consent of the Council, and to grant the Order, subject, however, to certain modifications and amendments. In the next case—that of Clay Cross—the Shirland and Higham Parish Council refused their consent to the Order, with the view of obtaining a reduction in the maximum price proposed by the Clay Cross Gas Company. The Board granted the Order, subject to a reduction being made and to other modifications and amendments. The Order applied for by the Hornsey Gas Company was not consented to by the Wood Green Urban District Council; but the Inspector who inquired into the matter (Mr. Ingram B. Walker) recommended that it should be granted on the following conditions:—

(1) The additional share capital to be limited to £160,000, with borrowing powers not to exceed one-fourth of that amount. (2) No retort or other works used for the manufacture or purification of gas, or for the manufacture

or storage of coke or other residual products obtained in the manufacture of gas, to be erected on the new scheduled lands within a distance of 170 feet westward from the eastern boundary formed by the Moselle and the house No. 27, Brook Road. (3) The River Moselle to be culverted through the Company's works, subject to the consent, if necessary, of the riparian owners, so far as it skirts the Company's property used by them for the purposes of their gas-works. (4) A clause to be inserted to carry out an agreement with the Hornsey Urban District Council as to pressure. (5) The Company to be restricted from using the new scheduled lands for the conversion or manufacture of residual products.

After considering Mr. Walker's report, the Board of Trade decided to dispense with the consent of the District Council, and to grant the Order subject to the suggested changes. Numerous objections were lodged against the Harwich Order on behalf of owners and occupiers of houses within 300 yards of the site of the proposed new works, and the Board of Trade appointed Mr. Walker to hold a local inquiry. He recommended that the Order should be granted subject to the restriction of the use of the new site to storage purposes only, and to a reduction in the amount of the additional capital proposed. The Board granted an Order on these conditions. The Syston and Thurmaston Order was opposed by the Thurmaston Urban District Council and by certain ratepayers of Syston; but Mr. Walker recommended that it should be granted subject to the insertion of a provision that if at the end of two years the Board of Trade were satisfied, upon the representation of the Council, that the Company were giving an inadequate supply of gas, they might put an end to their powers in that district, to the reduction of the proposed standard price, and to the increase of the proposed illuminating power of the gas to be supplied by the Company. The Board of Trade accordingly made an Order containing a provision giving effect to the Commissioner's recommendation, and fixed the maximum price of gas at 4s. 3d. per 1000 cubic feet, and the illuminating power at 15 candles.

In the following Orders, a maximum price per 1000 cubic feet of gas was fixed; power being reserved to the Board of Trade, after a defined period, to alter the maximum price or to substitute a sliding-scale: Bridge-of-Earn, 6s. 3d.; Clay Cross, 4s. 6d.; Skegness, 5s. 3d.; and Syston and Thurmaston, 4s. 3d. In the Bothwell and Uddingston Order, a standard price of 3s. 1d. was fixed, with a sliding-scale.

The Bridge-of-Earn Order contains a clause empowering the promoters to obtain a supply of gas in bulk from the Corporation of Perth. The Harwich and the Staines and Egham Orders contain restrictions with regard to the buildings to be erected on the scheduled lands. An agreed clause was inserted in the Hornsey Order, at the instance of the Hornsey Urban District Council, increasing the prescribed pressure at which the promoters were required to supply gas. A special clause was inserted in the Syston and Thurmaston Order to provide for an adequate supply of gas in the area of the Thurmaston Urban District Council. The Clay Cross Order contains an agreed clause as to the purchase of the undertaking by the Urban District Council.

The applications for Water Orders were in regard to Beccles, Burnham and district, Croft (Leicestershire), Marlow, Mid-Kent, Pinxton, Portsmouth, Uckfield, Woodford Halse, and Worksop. The Beccles and Worksop applications were for additional capital in respect of existing authorized undertakings; the Burnham and Uckfield, for extensions of the authorized limits of supply and for additional capital; the Marlow and Portsmouth, for power to construct additional works and for more capital; the Mid-Kent was only for an extension of the limits of supply; the Pinxton and Woodford Halse applications were for authority to maintain and continue existing water undertakings; and the Croft application was made in respect of a new undertaking, and power was sought to construct and maintain water-works and to supply water. Objections were lodged against several applications; and they were fully considered by the Board of Trade. Orders were granted in every instance, subject to certain modifications and amendments. The Worksop Order contained provisions authorizing the capitalization of a sum expended out of revenue for capital purposes, the dividend thereon being restricted to $4\frac{1}{2}$ per cent. In the case of the Marlow application, a supplementary Order was made by the Board after the Confirmation Bill containing the first Order had passed through Parliament, but before it had received the Royal Assent. The Order contained a clause agreed upon between the promoters and the Office of Works for the protection of the water supply to Windsor Castle.

There were three applications for Gas and Water Orders, having reference to Bridgend (Glamorganshire), the Goring and Streatley district, and Knutsford. The Bridgend Gas and Water Company and the Goring and Streatley District Gas and Water Company, Limited, applied for power to raise additional capital; and the Knutsford Light and Water Company applied for authority to maintain and continue additional water-works, and to raise further capital. The objections lodged in respect of the applications were fully considered, and the Board of Trade granted an Order in each case.

Five Bills were introduced into the House of Lords to confirm the various Orders—viz., the Gas Orders Confirmation Bills (Nos. 1 and 2), the Water Orders Confirmation Bill, and the Gas and Water Orders Confirmation Bills (Nos. 1 and 2). In addition to these Bills, the Water Provisional Order Bill to confirm the Marlow Water (No. 2) Order was introduced into the House of Commons. A petition was lodged in the Upper House against the Gas and Water Orders Confirmation (No. 2) Bill by the Thurmaston Urban District Council in respect of the Syston and Thurmaston Gas Order; but the Bill was passed without amendment. The opposition was renewed in the House of Commons; but it was withdrawn in consideration of the promoters having consented to the insertion of a clause as to the purchase of the Thurmaston portion of the undertaking by the Urban District Council. No opposition was offered to the remaining Orders, and the Bills passed through the various stages and received the Royal Assent. A clause was inserted in the Water Provisional Order Bill in Committee of the House of Commons to provide that the Orders contained in the Gas and Water Orders Confirmation (No. 1) Act should have effect from the 8th of August.

The number of Orders applied for since the passing of the Gas and Water Works Facilities Act, 1870, is 567; and the Board of Trade have made 526, of which 515 have been confirmed by Parliament.

LEGAL INTELLIGENCE.

HIGH COURT OF JUSTICE—KING'S BENCH DIVISION.

Wednesday, Dec. 17.

(*Before Mr. Justice* RIDLEY.)

Docwra and Son v. Hoddesdon Gas and Coke Company.

This was an action to recover £1775, being the balance of an account for goods supplied and work and labour done.

Mr. J. F. MOULTON, K.C., and Mr. W. F. MOULTON appeared for the plaintiffs; Mr. DANCKWERTS, K.C., and Mr. BARNARD LAILEY represented the defendants.

Mr. W. F. MOULTON, in opening the case, said that the action was brought to recover £1775 for work done and goods supplied in connection with the construction of a tank for a gasholder at Broxbourne. The defendants alleged that the tank was to be made water-tight to the satisfaction of Mr. Nixon, the Engineer, and Mr. Duesbury, the Manager; and if the plaintiffs were unable to complete the work, the defendants should have the right to take it over. They said the tank had not been finished to the satisfaction of either of the gentlemen named; that it was not water-tight; and that, as the plaintiffs had neglected to carry out the contract, the defendants had taken it over and completed it themselves. By way of counterclaim, they sought to recover various penalties. To this, the plaintiffs replied that the tank for which they tendered consisted of a circular wall with a natural bottom; and that during the process of construction the bottom was found to be not water-tight. The defendants called upon them to make a different bottom from that described in the specification; and by so doing they discharged them from the contract and all penalties. They further said that they never neglected to complete the work, and that Mr Nixon had refused to give the necessary orders.

Justice RIDLEY asked whether this was not a case which could be better tried by the Official Referee.

Mr. DANCKWERTS thought not, as there was a question of principle to be decided by a Judge of the High Court.

Mr. W. F. MOULTON said the defendants would contend that the plaintiffs were warned as to the state of the ground, and they further said that they had never refused to give the necessary orders. The facts of the case were as follows: The plaintiffs were a well-known firm of Contractors, and in March, 1898, they were invited by defendants to tender for the construction of a tank for a gasholder. In the contract it was stated that the soil to be excavated, so far as it was known, consisted of stiff clay; and that the tank was to be truly concentric, and water-tight, to the satisfaction of the Engineer. When the specification was prepared, the Engineer and Manager made a trial hole 9 feet deep, though the depth of the tank was to be 20 feet. They found at the top 3 feet of gravel, and then clay; so they decided not to go any farther. Having come to this conclusion, they hit upon the design of a tank, for which the plaintiffs tendered, consisting of a wall and a natural bottom of clay. Of course, if the bottom was not water-tight, the whole thing was useless. The plaintiffs naturally assumed that the defendants had asked for a design which would be useful to them; and that a tank had simply to be made as described in the specification. The work was started in April; and in May it was discovered that the bottom was gravel, and the plaintiffs at once realized that the tank, as specified, would be useless. Thereupon consultations took place between the parties, and it was finally arranged that the bottom should be puddled and concrete placed under the foundations of the walls. So matters went on, and up to June, 1900, the plaintiffs tried to make the bottom water-tight.

Mr. DANCKWERTS observed that the bottom was not water-tight now, and that the plaintiffs were not to be paid till it was.

Mr. W. F. MOULTON retorted that the plaintiffs had made a tank as specified.

Justice RIDLEY asked whether the same point was not raised in the case of *Thorne v. Corporation of London*, where a contractor agreed to build a bridge in a certain way which was found to be impossible. Another method had to be adopted, which cost considerably more than was originally contemplated; and it was held that the contractor was bound to pay the extra cost, as he had contracted to do the work. Here it could not be said that the tank was water-tight unless it had a bottom.

Mr. DANCKWERTS said the plaintiffs might just as well say that a round piece of glass without a bottom was a tumbler, or that the rim of a hat was a hat.

Mr. W. F. MOULTON said he should call evidence to prove that there were two classes of tanks—viz., one in water-tight ground, and the other which had water-tight walls and bottom. After some time, Mr. Corbet Woodall was called in; and he suggested various alterations which the plaintiffs expressed their willingness to do if they received orders. But the defendants declined to give them.

The following evidence was then called:

Sir *George Livesey*, examined by Mr. W. F. MOULTON, said he had designed a number of gasholder tanks which had been carried out at different places. The old-fashioned tank was always of brick and puddle; and sometimes it was constructed in a porous soil. At the Old Kent Road, the tanks were all in gravel; and they had to be puddled at the bottom and behind the walls. Sometimes a tank was built in clay; and in the London blue clay there was usually put a simple cylinder—the clay forming a water-tight bottom. The brick-work walls acted merely as the retaining walls, to hold up the side clay. When a company required a tank, it was their duty to ascertain the nature of the soil upon which it would stand.

Mr. DANCKWERTS remarked that this was a question of law or the Judge.

Examination continued: It was always his practice to make three or four borings in the circumference of tank, to ascertain what was the nature of the soil. If solid clay were found, the cost of construction

would be much less than if in porous soil. He would then tell the contractor that the soil was of a certain character, when a man would know what it was he had to contract for. If a contractor was not told what was the nature of the soil, he would naturally ascertain it for himself before making a tender. If nothing was said, he took it at his own risk. But if the specification told him what the soil was, then the responsibility rested on the person who drew up the specification, and not on the contractor. The original drawing shown in the specification indicated clearly that, in the opinion of the Engineer, the soil was of clay, because under the bottom of the wall was to be placed a bed of concrete, and nothing below it. If he (witness) had been the contractor tendering upon the specification, he should have said that this was a tank to be constructed in a clay soil, because the specification not only spoke of clay, but said: "The soil to be excavated, so far as is known, consists of stiff clay." It then spoke of filling in the back of the wall, and proceeded: "Nothing but this puddle clay shall be put in in any of the excavations outside the tank wall; and it shall be nowhere less than 1 ft. 6in., except below the coping-level." This meant that the lower part of the wall was thicker than the top. No engineer who knew anything about the construction of tanks would say that, if the tank was to be made in a porous soil, less than a foot of puddle at this critical part would be of any use. He took it to be clear, from the specification, that the Company's officer believed the tank was to be constructed in impervious clay. This is what he should have understood; and no doubt the contractor did so. When it was found that the soil was not of clay, of course it would have been madness to put in a tank without a bottom.

Justice RIDLEY: How do you deal with the clause which provides that no alterations in the contract shall release the contractor from responsibility with regard to the soundness of the tank?

Witness: If the contractor was led to suppose that the foundation was in clay, and it turned out that it was not, the Company should say it was not a mere alteration, but a radical change in the construction of the tank, and allow for it.

Examination continued: An alteration in design or construction of the tank being necessary, such alteration must be paid for at prices contained in the schedule.

Justice RIDLEY: What would you say if the contractor found that the bottom had to be puddled?

Witness: The contractor might very well say: "You asked me to construct a tank in clay; and this is a totally different thing." The contract would not then apply. A puddle tank in porous soil would be quite double the cost of a tank in clay. One great difference was that in clay there was no pumping—it was all simple excavation; whereas in porous soil there was the expense of pumping, the danger of drawing sand, and a great deal of other trouble and expense.

In answer to questions by Mr. MOULTON, witness said even where they had impervious clay they required to have a wall and a tank for the guides to work in. They could not put them into clay.

Cross-examined by Mr. DANCKWERTS: If a tank leaked seriously, it was of no use at all; but he knew scores of tanks which were leaking, and were being supplied regularly with water. Of course, a tank must be kept full, as the water acted as a seal to prevent the escape of gas. Unless the seal was there, the gasholder would not rise.

Mr. DANCKWERTS: Supposing you were asked to construct a brick and water-tight puddle gasholder tank, would that cover a structure which had the bottom and sides clay puddled?

Witness: I should not call that a brick and puddle clay tank, because it would not be puddled over the bottom. Brick and puddle means puddled everywhere. If the tank was constructed in clay, no puddle would be wanted. The only place where puddle would be wanted would be at the side walls above the clay. He should call a brick and puddle tank one that was puddled all over.

By Justice RIDLEY: He should not describe the tank as a brick and puddle one, because puddle was put behind the wall to a certain depth. Brick and puddle meant that there must be puddle all over the floor; and in this case the specification indicated clearly that there was to be no puddle on the bottom.

Mr. DANCKWERTS said the Company were to pay extra for the puddle over the bottom.

Justice RIDLEY: How do you describe a gasholder tank which is not to have a puddle bottom where there is clay already?

Witness: I should put in the specification that the tank was to be constructed in clay—a brick tank to be built in clay soil. Using the term "brick and puddle tank" was a misnomer if the tank was constructed in a clay soil.

Mr. *Charles Preston*, examined by Mr. W. F. MOULTON, said he had had 35 years' experience in the construction of gasholder tanks, and he agreed with the evidence given by the previous witness. He looked upon the words "brick and puddle" as including both classes of tanks of which the witness had spoken, just as applicable to the bottomless kind as to those where puddle extended all over.

Cross-examined by Mr. DANCKWERTS: The plaintiffs had done a great deal of work for the New River Company; among other things, sinking a deep well within 140 yards of defendants' gasholder.

Mr. *C. Wallace Robinson*, examined by Mr. W. F. MOULTON, said he was Outdoor Superintendent of the plaintiff's firm, having been in their service for the last thirty-six years, during which time he had been principally engaged upon the erection of gas-works, of which he had constructed about 30. Before tendering for this work, he visited Broxbourne and inspected the place. He was shown a square hole which passed through the clay, and was told that the clay went to the bottom. He had charge of the work.

Witness was about to be taken through the details of the work, and examined as to the correctness of the charge for it, when his Lordship pointed out that this must be inquired into before the Referee.

Examination continued: The tender was prepared by him on the faith of the drawings, and on the understanding that a circular tank was required without a bottom. Two months after commencing the work, the bottom was found not to be clay. Mr. Nixon's attention was at once called to this; and he ordered 1 foot of puddle to be put under the wall. Witness suggested that the puddle should be 18 inches thick; and this was acceded to. Afterwards 1 foot of puddle was put over the bottom; but this was not effectual.

By Justice RIDLEY: This was done as an extra.

Mr. DANCKWERTS remarked that the Company had always been willing to pay for it as one.

Thursday, Dec. 18.

On the hearing being resumed this morning,

Mr. DANCKWERTS stated that the parties had come to terms, and it was arranged that out of the £700 which had been paid into Court, £500 should be handed to the plaintiffs and £200 to the defendants. There would be no costs.

His LORDSHIP asked how the plaintiffs were paid for the extra work done on the bottom of the tank.

Mr. DANCKWERTS said the Engineer had calculated the amount of the extra work; and had fixed at £530 the sum that would have to be paid. The plaintiffs were not satisfied, and the defendants told the Engineer they were willing to place the Contractors in the position they would have been in had they fulfilled the contract. The defendants were willing to do the fair thing to the plaintiffs, rather than rest their case upon technicalities.

His LORDSHIP said he thought the judgment of Lord Cairns in Thorne's case was a difficulty in plaintiffs' way. There it was laid down that a person must not take payment for an extra if he was going to say it was not an extra.

Mr. DANCKWERTS said the action would be stayed upon the terms arranged.

HIGH COURT OF JUSTICE—KING'S BENCH DIVISION.

Friday, Dec. 19.

(*Before Mr. Justice* GRANTHAM *and a Special Jury.*)

Gutch v. Welsbach Incandescent Gas-Light Company, Limited.

In this case, Mr. George Augustus Gutch sought to recover damages from the Welsbach Incandescent Gas-Light Company for alleged wrongful dismissal. In February, 1899, plaintiff was employed by the Company as Commercial Manager; and he alleged that they agreed to retain and employ him in this capacity until June 30, 1900, and thenceforward from year to year at a salary of £1250, together with a commission on the profits of the business—the employment to continue until determined by a year's notice expiring on the 30th of June in any year. Alternatively, it was claimed that the employment was determinable upon a "reasonable notice," and that this would be a year's notice. The defendants denied the agreement, and said the plaintiff was only entitled to reasonable notice—three months.

Mr. DICKENS, K.C., and Mr. BATTEN appeared for the plaintiff; Mr. DUKE, K.C., and Mr. MAYER represented the defendants.

The plaintiff was called, and stated that in 1895 he was appointed Assistant-Manager of the Incandescent Gas-Light Company. In 1897, when the Welsbach Company was formed, with a capital of £3,500,000, he was appointed Secretary, at a salary of £750 a year. His principal duty was to attend to the litigation in which the Company was involved. In 1899, he was approached by the Chairman with a view of taking the post of Commercial Manager, which position he accepted at a salary of £1250 a year and commission. He discussed with the Managing-Director the question of the length of notice to which he was entitled.

Mr. DUKE objected to anything being given in evidence which was not stated at a Board meeting.

Mr. BATTEN said he could not put it that there was any binding contract.

His LORDSHIP declined to receive the evidence.

The witness was then examined at some length as to the various duties he had to perform, and as to the appointment of the Advisory Committee, who adopted a policy of reducing prices and stopping litigation. He said that after Mr. Buchanan was appointed General Manager, he (witness) received three months' notice; and, upon protesting, he was informed by the Chairman that the Company was not a philanthropic institution. Several clerks who were dismissed had received six months' notice.

In cross-examination at some length as to the litigation in which the Company had been engaged, witness persisted in the statement that every £5000 spent on litigation brought £50,000 into the coffers of the Company. He admitted that the Advisory Committee reported that there was an absence of direction and responsibility, largely owing to the multiplication of officers and loss of energy in different departments, and that a reorganization of the staff was necessary.

At this stage a conference took place between the parties. In the result,

Mr. DICKENS expressed his pleasure in stating that the case had been settled. In addition to the three months' salary, which had been handed over, the Company had paid a further three months' salary into Court, with a denial of liability; and it was arranged that this sum should be paid out to the plaintiff—the defendants undertaking to defray the costs up to the date of the payment into Court, and each side bearing its own costs from that time.

His LORDSHIP thought the arrangement a very fair one.

RAMSGATE BOROUGH POLICE COURT.—Thursday, Dec. 18.

(*Before Mr.* H. B. HAMMOND, *Chairman, and a Bench of Magistrates.*)

Curious Charge of Damaging Gas-Meters.

This was a case in which Thomas Leggett, an engineer, of Ramsgate, was summoned at the instance of Mr. T. N. Ritson for wilfully injuring or suffering to be injured, certain gas-meters (the property of the Ramsgate Corporation) in 25 houses, by causing water to pass into

the pipes connected with such meters, thereby doing injury to the extent of £50. There was also another summons for "maliciously committing damage, injury, and spoil" to the meters; but this was withdrawn, as under it defendant could have claimed the right to go before a jury. Defendant pleaded not guilty.

Mr. G. THORN DRURY prosecuted on behalf of the Gas and Water Committee; Mr. J. EMERY defended.

Mr. DRURY explained that the proceedings were taken under the 38th section of the Gas-Works Clauses Act, 1871, which provided that any person who wilfully injured the meters belonging to the owners of the undertaking should be required to pay for every such offence a penalty not exceeding £5, and also the cost of the damage. The facts of the case were these: On the 6th inst., complaints were received that something had gone wrong with the gas in the St. Luke's district. When the workmen went to the place, they discovered that a large quantity of water had found its way into the mains. Eventually the area of search was narrowed until suspicion fell upon a house called "Cotswold," on the Dane Park estate, which for a considerable time had been shut up. The premises were locked; and a bill appeared in the window stating that defendant was the agent for the house. Application was made to the owners of the premises for permission to enter the house, and on the 12th inst. this was done. He then proceeded to show by means of a model, the state of things found by the gas-works representatives upon entering the house and inspecting one of the water-closets, and said it would be proved by evidence that a piece of piping had been fixed from the water supply-pipe and carried under the doorway of the water-closet to the gas-pipe outside. This piping had been supported on a nail driven in the wall above the doorway. By this means, 400 or 500 gallons of water had found its way into the gas-mains. Such a thing could only have been done out of spite, and intentionally. As it was, 25 meters belonging to the Corporation had had to be replaced; and this represented damage to the extent of £50. As lately as last month, the defendant was convicted by the Bench of an infringement of the building bye-laws. He seemed to have had the idea that Mr. Woodhall, a member of the Town Council, had something to do with that prosecution, for on the 2nd inst. he was on the business premises of Mr. Woodhall, who remonstrated with him. Mr. Woodhall remarked that defendant had had to pay; and defendant admitted that he had got the worst of it, but added: "Mark my words, you will have to pay pretty dearly for it." Mr. Woodhall inquired why he should be called upon to pay; and defendant replied that he meant the Council, and stated that he had "something up his sleeve." Clearly, defendant was determined to avenge himself on the Corporation; and thus a motive was found. Where all this mischief originated was in a house the only person able to obtain access to which in the ordinary way was the defendant himself; and the first week in December he was seen near the place. There was a more important matter than that, for the work could only have been done by a plumber. Now, the defendant was a man with a thorough knowledge of plumbing, and was quite cognizant of the steps to be taken to secure an effect like that described. There had been found upon the premises pieces of sal-ammoniac, solder, and charcoal, showing that someone had recently been employed in such work at the house. "What," asked Mr. Drury, "was the action of the defendant when he knew the mischief that had been caused by the water getting into the gas-mains?" He was a spectator of the efforts of the Corporation men to find out where the thing originated; but, although he was the agent for the letting of the house, and had seen the men near the premises, he never had the curiosity to inquire what was being done. Yet he was known as a man who did not spare his time when interesting himself in other people's business. If the Bench decided that the defendant was not the person who committed the damage, they would have to assume the existence of some other individual with a spite against the Corporation, the means of access to this house, and the necessary skill.

Mr. *F. A. Coleman*, chief inspector of gas and water fittings to the Corporation, said that on the 6th inst. he received a complaint about the gas. The complaint came from Denmark Road. Witness first sent a fitter to the house, and afterwards went himself. About the same time, a number of people came from other houses to see what was the matter. He found that a full supply of water was coming from four main taps off the gas-main. He disconnected the meters at four houses in Salop Terrace, Denmark Road, and endeavoured to find out whence the water came. From the Saturday until the Tuesday, they looked in vain for the source of the mischief. On the Tuesday afternoon, however, witness's investigations were directed to "Cotswold." They had to change 25 meters, and to spend two or three days clearing fittings. In some cases water had worked through chandeliers, and on to tables. The meters, with the cost of labour in fitting, were valued at £2 each. The main in St. Luke's Avenue was so affected that a portion of it had to be relaid. The meter at "Cotswold" was brought away on Sept. 1, 1889, and the water was cut off at that time. No gas or water had been supplied since then. Witness found, on visiting the place on the 10th inst., that the water supply at the house had been turned on. He discovered this by trying the outside stop-tap. The water could not be turned on without a key or a pair of pliers or tongs. On the following day, he carefully examined the service in the adjoining house, and found it was perfectly dry. Next day, as the Engineer had obtained permission from the owner to enter the house, witness broke the scullery window and opened the casement. Up to that time there were no signs of forcible entry into the house. On entering, witness noticed in the water-closet that the two unions on the water-pipe had been disturbed—the paint around them had been removed, and the sharp edge had been taken off by tongs or grips. It would not be possible to remove the unions without the use of plumbers' tools. Then he discovered that the cap-socket on the gas-tap outside was only "hand tight." A nail had been driven in the wall over the water-closet. On the floor of one of the front rooms a piece of sal-ammoniac was found, and on the dresser in the kitchen a piece of candle that had the appearance of having been recently used. On the following Monday, witness found, in the same room as he discovered the sal-ammoniac, some small pieces of charcoal and solder. The main tap was wet inside, and there was water on the floor of the closet. Water had been introduced from the water-pipes to the gas-pipes; and he was sure that in this house was the origin of all the damage. The main was full from St. Luke's Church to Hardres Road; and the side roads were full up for about 60 yards either way. Witness suggested that the nail was put in the wall to support a piece of tubing which had connected the gas and water pipes.

Other evidence bearing out Counsel's opening statement having been given,

Mr. EMERY addressed the Bench on behalf of the defendant. He submitted that no real evidence had been called to connect his client with the offence, or to show that the mischief originated at "Cotswold." There was no mark, scratch, or other sign that the work suggested had been done at the water-closet; and a practical man had given it as his opinion that the pipes had not been touched for many months. What happened was that on Nov. 24 defendant went to the house, and found that someone had broken a window there. He reported the matter to the police, and asked that they would give their attention to the particular house in which it was alleged he intended to work the mischief. A man who would deliberately do a thing like this, who would injure people against whom he owed no grudge, deserved no consideration from anyone; and if the Magistrates branded him in the way the prosecution wanted, he could never face one of his fellow residents without feeling that that person regarded him as a malicious and wilful man.

Defendant was called, and explained that, when saying to Mr. Woodhall that he had "something up his sleeve," he was referring to the forthcoming municipal elections. The last time he was in "Cotswold" was eight or ten weeks ago. He had had several disputes with the Corporation, and had written to the Local Government Board making a complaint. He bore out Mr. Emery's statement in other respects.

Mr. *J. Assiter*, a plumber and decorator, said that in his opinion it was some months since the pipe-unions had been disconnected. He thought that a pound weight would have brought down the nail referred to. He could not explain how the water got into the gas-pipes.

The Magistrates retired, and after a consultation lasting twenty minutes,

The CHAIRMAN said they had decided that there must be a conviction; and they felt bound to mark their sense of the offence by fining defendant the full penalty of £5, and ordering him to pay the damage, amounting to £50. He would also have to pay £1 2s. 6d. costs. In default, defendant would have to go to prison for one month. A month would be allowed for payment.

It is stated that defendant has since lodged notice of appeal.

THE CLAIM IN THE AUSTRIAN LAW COURTS AGAINST BARON AUER VON WELSBACH.

In continuation of the report in the "JOURNAL" for the 9th inst. (p. 1556) of the first day's proceedings in the action instituted by Baron Auer von Welsbach against Herr Rund, an Engineer, who had advanced claims to a share in the profits arising from the sale of the improved Welsbach mantle, we give below a report of the proceedings at the adjourned hearing of the case on the 9th of December. The subjoined account is translated from the reports in the "Neue Freie Presse" and the "Neues Wiener Tagblatt" (the morning and evening editions).

Tuesday, Dec. 9.

The proceedings in the action were resumed to-day. The main issue, it will be remembered, is whether Baron Auer discovered his incandescent gas-light before or after June 23, 1891. This matter was to be cleared up to-day by the examination of several witnesses.

Dr. Gallia, the plaintiff's Counsel, was the first witness examined. He made this statement: On Aug. 10, 1891, Baron Auer came to me and handed me a patent specification for the new light. He requested that the specification might be at once handed in to the Official Bureau on the same day. I had, under these circumstances, neither time nor permission to examine the specification. When I did so a short time afterwards, I called attention to the fact that it appeared from the description that a substance, compounded of a trace of ceria with another rare earth, when used for the production of mantles, gave especial illuminating power. It did not appear, however, from the specification what this substance was, nor in what the invention consisted. Baron Auer said to me in reply: What the substance was he did not yet know himself. He conjectured that it was no longer thorium; and he thought science was at fault in regarding thorium as an element. He was of opinion that he had dissociated thorium; but he could not at that time make such a statement in a patent specification, as he still had further researches to carry out in order to come to a final verdict on the question in a manner which would enable him to satisfy the scientific world. He knew that the patent specification, handed in on Aug. 10, 1891, was held by the patent officials to be defective, and was not accepted. Time was allowed for its amendment; and he hoped during this period to find leisure to answer the above question by means of exhaustive experiments. I discussed the matter with my friend, the well-known patent-law expert, Victor Karmin; and we came to the conclusion that the patent authorities were obliged to grant a patent when the subject thereof consisted of a substance of which the method of preparation was known, but which could not be designated by name, to be used in combination with another substance, for illuminating purposes. Thereupon I drew up, in collaboration with Karmin, a specification, and submitted it to Baron Auer. I put in a rough draft of an outline of this specification. It shows that one of the substances which gives the cerium light could not be designated by name. This outline was not completed by Baron Auer because experiments which he made after Aug. 10 showed that the substance in question was a thorium; but not thorium as it had been known up to the year 1891. The thorium previously produced had

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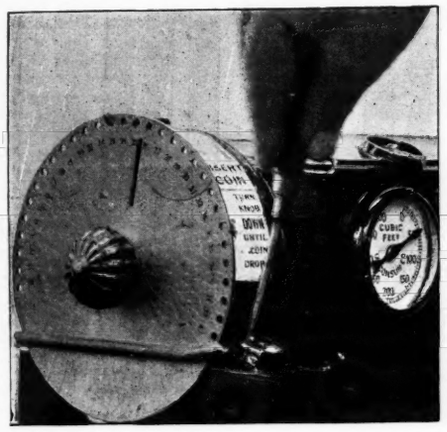

Fig. I.
Break Company's Seal and Remove Screw—THUS.

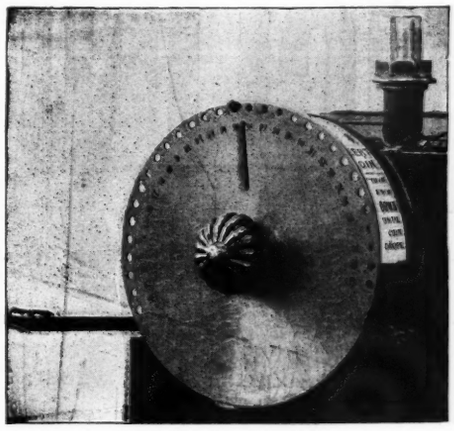

Fig. II.
Swing Band Back—THUS.

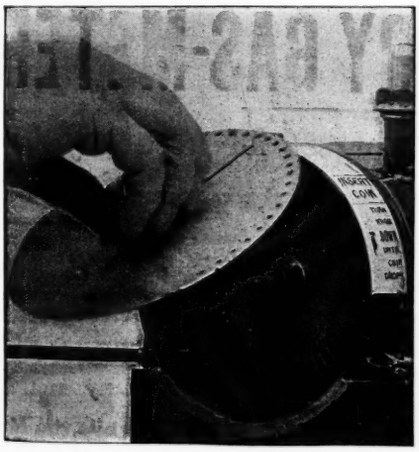

Fig. III.
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Fig. IV.
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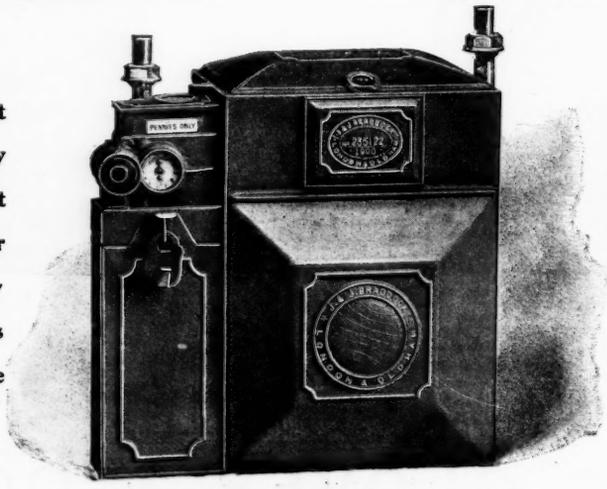

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been called, and was believed to be, "pure." This thorium, as known before 1891, gave considerable light. But the thorium which Baron Auer first produced in 1831 gave, comparatively speaking, no light. The thorium prior to the year 1891 was not pure, but contained admixtures of other substances, which there was no known way of removing. Baron Auer succeeded, by the process which he discovered for producing pure thorium, in getting rid of all admixtures. The non-illuminating absolutely pure thorium gives, with only a trace of ceria, considerable light. It appeared in this way that the thorium which had erroneously been called pure was not a compound body, but was merely impure. In order to invent the new mantle, it was therefore absolutely necessary first of all to discover a thorium which had been quite unknown prior to Auer's discovery.

Witness produced a decree from the Official Bureau of November, 1891, in which the specification of August, 1891, was declared defective and rejected. A new specification was prepared, which, however, again failed to satisfy the authorities. A third specification was sent in; but this also was objected to by an ordinance of the Bureau of June 2, 1893, stating that precise information was required as to the thorium which was to be employed according to the specification.

Dr. Elbogen: It is, however, clear that the original specification was handed in on Aug. 10, 1891.

Dr. Gallia: The specification then handed in was only that in which perfectly pure thorium oxide was spoken of, which does not give any light of itself, but is excited into marvellous luminescence through ceria being added to it. It is correct that the Austrian Ministry of Commerce has acknowledged that this invention had been already embodied in the earlier patents. The Berlin Supreme Court attributed, however, to this invention a topical and independent significance.

The President: When was Baron Auer first in a position to reproduce at any time from the raw material at his disposal the mixture in the proportions discovered by him of 99 per cent. absolutely pure thorium and 1 per cent. ceria?

Dr. Gallia: I was not informed by Baron Auer of the separate stages of his labours, as he maintained secrecy regarding them. I only know that this must have taken place barely a day or two before Aug. 10, as Baron Auer is accustomed, when he makes a discovery, to draw up a specification of it at once.

Dr. Elbogen: Surely Dr. Gallia is not an expert as to Baron Auer's habits!

The President: When did Baron Auer first discover the process for producing pure thorium from monazite sand; and when was he able to reckon out the manufacturing costs for the technical process on the large scale?

Dr. Gallia: After I had applied for the patent for Baron Auer on Aug. 10, 1891, he told me that he must still work in order to devise a process for the extraction of thorium from monazite sand cheaply and on the large technical scale. Auer could not, therefore, at that time either have applied for a patent for the particular process, or have known the manufacturing expenses. Witness stated that the description of the particular process for producing the present incandescent light was first deposited under seal with the Notary, Dr. Wagner, on June 17, 1893.

The President: Whence, and when, did Baron Auer obtain monazite sand in sufficient quantities for the manufacture of thorium, and when did he make a reliable calculation of the expenses?

Dr. Gallia; Monazite sand had no technical application before Auer used it. It occurs in America, especially in Brazil. It was decided at the meeting of the Austrian Incandescent Gaslight Company, held on June 17, 1893, to send out Mr. Williams to America, to make inquiries for monazite sand in Carolina and other likely places.

The President: That is two years after the agreement was cancelled; so the details do not interest us. When was the first contract made for large quantities of monazite sand?

Dr. Gallia: On May 21, 1894, a contract was made with Mr. Gordon for 500 tons of monazite sand; but the contract was not a binding one, because Gordon declared that he did not know whether he could find so much sand.

The President: Was that the first contract?

Dr. Gallia: Gordon sent some of this sand in 1892; but there was no contract. Auer in 1888 obtained a small quantity—2 tons—of the sand from the Welsbach Light Company at Philadelphia.

The President: About 6 per cent. of thorium could be obtained from this?

Dr. Gallia: Yes; but at that time, Haitinger, the Manager, was working at this sand in order to get lanthanum; and he thus obtained 10 to 20 kilogrammes of thorium salts, but no pure thoria.

The President: Do you know how the price of the new light fluid compares with that of the old light fluid?

Dr. Gallia: No; I do not.

The President then asked witness whether he thought that, according to the agreement of that date with Rund and Lang, Baron Auer would have been under an obligation to give a new lighting process, costing three times as much as the old in the manufacture, at the same price, or whether a new agreement would have been necessary. Dr. Gallia stated that they would have had to make fresh terms about a new lighting process, as the agreement could not be applied at all to the new fluid.

The President: But Baron Auer disposed of improvements on the old process as well as it?

Dr. Gallia: Yes; but the new fluid was, indeed, no improvement, but a new invention. If Rund and Lang had wanted to have new fluid, Auer would have said "It is at such and such a price." A new agreement with a new price would have had to have been made. We have sold the new fluid to the whole world at the same price; an American Company make it according to our recipe.

The President: It is stated that the new light had already been used in the Café de l'Opéra in the year 1891.

Witness: It is true that installations of the new light were made in the Café de l'Opéra on Nov. 4, 1891. But they were experimental, as at that time there was so little of the new fluid that the works in the Schleifmühlgasse (Vienna), where the Auer mantles were made, frequently had to remain idle. In order to obtain half-a-kilogramme (1·1 lbs.) of fluid from Auer, we had to send to his laboratory at Atzgersdorf, and beg him, in consideration of the stoppage of the works, to manufacture some of it. He had to make us a small quantity of the fluid once when he was ill; and when Berlin wanted a kilogramme of fluid for experiments, the Manager, Kruger, had to come from Berlin to Vienna to fetch it.

Dr. Elbogen: It is settled that the new light, produced from monazite sand, had been burning in November, 1891, in the Café de l'Opéra.

Dr. Gallia: That was done with the first kilogramme of fluid which Baron Auer had made.

Dr. Elbogen remarked that Dr. Gallia was leaving the audience chamber, and could communicate with the witnesses waiting outside. The President ordered him to remain in the Court. A lively controversy ensued between Dr. Elbogen and Dr. Gallia as to the identity of the Austrian and German patent specifications. Dr. Gallia produced both of them.

Dr. Elbogen: Do you know, Doctor, when the new light was burning for the first time in Auer's laboratory?

Dr. Gallia: I do not know what you mean by the new light.

Dr. Elbogen: The light for which a patent was applied on Aug. 10 was a similar light.

Dr. Gallia: The new light—made synthetically from 99 per cent. of pure thoria, and 1 per cent. of ceria—which corresponds with the patent specification, was first discovered by Baron Auer, he told me, in August, 1891.

The President: What was the day on which Baron Auer first beheld the light suddenly flash out with its present intensity and power?

Dr. Gallia: Baron Auer is summoned, and will answer this himself.

Dr. Elbogen: Did you see such a lamp burning in the laboratory prior to June 23, 1891, giving a white light of 100 candles power?

Dr. Gallia declared that he could not say, as he was not an expert.

Dr. Elbogen: You won't answer me!

Dr. Gallia: Yes; but I will not give the answer which you want. (Laughter.)

The President: I think it likely that such a question is very difficult to answer. How could Dr. Gallia know whether a white light was the new light?

Dr. Gallia: I am not an expert, and could not know, if I saw a white light, whether it was the new light.

Dr. Elbogen: Did Baron Auer speak to you before June 23 about the invention which he tried to patent on Aug. 10?

Dr. Gallia: Baron Auer talked with me about *x* inventions; possibly he also told me that he was again working on a discovery with the rare earths. Baron Auer will say more on this himself.

Dr. Elbogen repeated his question. Dr. Gallia said he would not be caught in a trap. Dr. Elbogen protested against this insinuation and forwardness. Dr. Gallia retorted, and the President in the end restored quiet.

Then, through the medium of Dr. R. von Korper as interpreter, the Director of the Austrian Incandescent Gas-Light Company, Fred de la Fontaine Williams, was called as a witness. He stated that, so far as he could remember, he came to Vienna in June, 1891, and was sent by Baron Auer to America in July to procure a large quantity of monazite sand for him, which he wanted to use for a new light. He went to New York, and there negotiated with Gordon, who, in August or September, sent 2 to 3 tons of monazite sand to Vienna. Baron Auer wanted a larger quantity; but Gordon could promise nothing, and said that he would write to his brother in Brazil.

Dr. Elbogen: May it not have been the end of June when Baron Auer sent you for the monazite sand?

Witness: Possibly.

Dr. Elbogen: Did you at that time already see the new light burning?

Witness: I do not remember. Very likely; but I cannot say for certain.

Ludwig Haitinger, a Chemist and present Manager of the Austrian Incandescent Gas-Light Company, was then called. He stated that in 1890 he brought his own invention of the Haitinger incandescent light before Dr. Auer, and it was then tested in Auer's laboratory.

The President: When did you learn that Baron Auer had discovered a new light, consisting of 99 per cent. of thoria and 1 per cent. of ceria?

Witness: That first came to my knowledge in December, 1891.

Dr. Elbogen: And in November it was already burning in the Café de l'Opéra!

Witness: I know nothing of that.

The President: Were you not then in Baron Auer's employ?

Witness: Not then; I was in the spring of 1890, and then not again until the spring of 1892.

The President: When you consulted him about your light, did he speak to you of his own experiments?

Witness: He mentioned that he was working on a combination of thoria and ceria. But I know that the new light was first produced on the manufacturing scale in the beginning of 1892, as the factory at Atzgerodorf was idle up to the spring of that year, and Baron Auer was working with some people at the end of 1891 on the production of the new fluid.

The President: Did you not before that see the present Auer light in the house or in Auer's laboratory?

Witness: No; I was busy with my own incandescent light of aluminium oxide, which was tested photometrically in Auer's laboratory in Theresianumgasse, and in the office of Kuschenitz, the Secretary.

The President: That is very important. It is stated, in support of Rund's case, that Herr Kuschenitz, in the spring of 1891, took Herr Theodore Friedmann, who was then Chief Clerk to the firm of Lindheim, who then owned Auer's patents, to see a new light, which was burning in the laboratory in the Theresianumgasse. This must have been Dr. Auer's newly invented incandescent light, and Herr Kuschenitz had said to Friedmann: "Advise Lindheim not to sell the Auer patents." But the plaintiff contends that it was not Auer's new light, but the Haitinger light which was then being tested.

Witness: I do not know more. I can only say that several mantles of my invention were burning there, and that I have not seen others; but I did not go there often.

To a question of the President, as to the difference in price between a kilogramme of the old and of the new fluid, witness stated that at the commencement of manufacture, the cost of production was very high, and that as larger quantities were made, it continually became less expensive.

Dr. Elbogen (to defendant Rund): How was the new fluid supplied to you in Switzerland?

Herr Rund: At £4 15s. sterling per kilogramme.

The President: When was that?

Herr Rund: In the year 1893.

The President: Yes; that was two years later still.

Dr. Gallia: And it was supplied by the Incandescent Gas-Light Company at Vienna to its branch Institute.

The President: It must not be forgotten that the price of the fluid lay in Mr. Gordon's hands, as it was dependent on the quantity and price of the raw material. He was the master of the situation.

Dr. Elbogen: Yes; so long as thoria was not made from thorite as well.

The President then made some observations on the quandary in which an inventor finds himself in having to choose between disclosing his invention before it is perfected and running the risk, by delaying to do so, of seeing some one else anticipate him. He asked witness whether he thought Auer's invention was a finished one when the patent was applied for on Aug. 10, 1891.

Witness: Whether it was finished in the sense that it could be carried out on the large scale, given the requisite quantities of monazite sand, I do not know.

Dr. Elbogen: Could the light of your mantle, which had a yellowish red colour, be confounded with the new white Auer light?

Witness: By anyone who had a practised eye for the different varieties of incandescent gas light, certainly not.

Dr. Elbogen: And Friedmann was a technical man!

Dr. Gallia: Your mantle was of 62-candle power. What is the power of the present Auer light?

Witness: 60 to 70 candle power. Of course, my light only maintained this power for a few days, and then deteriorated; consequently it was of no use.

The President: Could Herr Friedmann have been mistaken then, and taken the Haitinger light for the new Auer light?

Witness: The new Auer light did not exist at that time.

The President: Why do you assume that?

Witness: When I communicated my invention to Dr. Auer, I am convinced that he would have told me that he was working at something better, if he had been doing so; and he did not.

Dr. Gallia: Did not the firm of Lindheim, who were then representing the Auer light, make an offer to you in the spring of 1891?

Witness: Yes; here is a letter in which I was invited, on Feb. 5, 1891, to enter into negotiations for the acquisition of the Haitinger light. I said that it was not yet ripe.

This concluded the evidence of that witness; and the President announced that the witness Friedmann had not presented himself. It was decided, therefore, to examine witnesses called on behalf of the defendant. The patent law expert, Victor Tischler, and Baron Auer's former chief clerk, Ferdinand Sattler, were called. Both these witnesses were to be questioned as to whether they had seen the new Auer light burning prior to June 23, 1891. They entered the Court, and made a statement that they must refrain from giving evidence. Dr. Hermann Roth, representing Herr Sattler, said that his refusal was due to his having given a written pledge of secrecy as a high official of the firm of Auer; and he relied on the statute by which trade secrets must not be divulged. Herr Tischler explained that, though Baron Auer's last patent had been applied for, not by him, but by Dr. Gallia, yet, as he acted earlier as patent agent for Baron Auer, he was under obligation not to violate the confidences; and he asked not to be examined.

Dr. Elbogen: As neither of the reasons given are good ones, and there can be no question of violating technical or business secrets, because the only question to be asked is whether they have seen a certain light burning, I ask that they may give evidence. I look to Herr Auer to liberate Herren Sattler and Tischler from any obligation of secrecy in this matter; and I call upon him, as he is present in Court, to announce that he desires these gentlemen to speak.

Dr. Gallia: What is said by the other side makes it appear that there is something in this to be concealed. But it is not so; and Dr. Elbogen knows that neither of these gentlemen has had any relations with Baron Auer at the critical period. It would be the most reasonable and speediest plan for both to give evidence; but we have no ground or right to free them from a pledge of secrecy.

Dr. Elbogen then asked the President to request Baron Auer to release Herren Sattler and Tischler from their pledge; and Dr. Gallia said he had no objection. But Dr. Roth pointed out that it rested with the Court entirely to decide the point, and that Baron Auer had no power to intervene. The Court withdrew to consider the matter; and the President afterwards announced that it had decided that there was no reason why the witnesses should decline to answer the one question which was to be put.

Herr Tischler was then sworn; and the President put the question to him: "Have you seen the light, for which the patent was applied for on Aug. 10, burning either at Baron Auer's house or laboratory or elsewhere, prior to the 23rd of June?

Witness: I regret that, in spite of the decision of the Court, I cannot give evidence. I am, as a patent law expert, pledged to secrecy, and ask to be exempted from giving evidence.

Dr. Elbogen: With all deference to this witness, I must ask the Court to deal with him, and take the prescribed measures for compelling him to answer.

The President then read the section of the statutes which condemns a refractory witness to a fine, or imprisonment for a term not exceeding six weeks, and asked the witness whether he would give evidence. Witness replied that there was even another reason why he must refuse—namely, that he had been agent for a German patent of Auer's, and was therefore certainly pledged to secrecy.

The President: Do you persist in refusing to give evidence?

Witness: Yes.

The Court then retired; and the President afterwards announced that the witness must appear at the next sitting and give evidence on pain of a fine of 500 kronen (about £21). Witness said that he was sorry, but he would not be able to give evidence.

Herr Sattler was then called, and, having been sworn, said that he was a partner in Herr Tischler's firm of patent agents. The President put the same question to him as to Herr Tischler; and he replied that he must decline to answer for the same reasons.

Dr. Elbogen pointed out that this witness could not plead the same obligations to secrecy as Herr Tischler, as he was only tied by Baron Auer's word; and he asked that forcible measures should be taken by the Court.

The witness explained that, with him, it was not merely a matter of a heavy penalty is case of violation of secrecy, but that, in Auer law cases especially, he had been so often dragged from Court to Court, and when he spoke the truth had found himself in an invidious position with one or other of the parties, who suspected him, and made attacks on him against which he was defenceless. He must therefore decline to give evidence.

The President: I grant that it is not pleasant to be a witness, and incur special odium even when speaking the whole truth.

The Court decided in this instance also to compel the witness to give evidence under pain of a fine of 500 kronen.

The proceedings were then adjourned.

ACTION FOR INDUCEMENT TO VIOLATE AN AGREEMENT.

At the Birmingham Winter Assizes, on Monday and Tuesday last week, the Lord Chief Justice and a Jury were engaged in hearing an action brought by the Eveson Coal and Coke Company, Limited, against the Victoria Tube Company for wilfully and maliciously persuading an employee of the plaintiff Company to violate an agreement. Mr. Lawrence, K.C., who, with Mr. Leslie, appeared for the plaintiffs, stated that Mr. G. J. Eveson, the founder and principal shareholder of the Company, had in his service a Mr. Thomas Cash as principal traveller. When in 1897 the business was taken over by a limited company, Mr. Cash entered into an agreement by which he received certain benefits and advantages in consideration for devoting his whole time and abilities to the business. In 1901, it was discovered that he was acting in contravention of the agreement; and he was discharged. He brought an action for wrongful dismissal and arrears of salary; but the case was settled on the terms of Mr. Cash consenting to judgment and costs. The plaintiffs alleged that it was then discovered that the Victoria Tube Company had been employing Mr. Cash while he was in their service; and the sole question now was whether or not that Company had any knowledge of the fact that Mr. Cash was really in the employ of the plaintiffs. Evidence bearing out Counsel's statement was given by Mr. G. J. Eveson and by Mr. J. S. Dymock, the Manager of the plaintiff Company. Mr. Norman Cash, son of Mr. Thomas Cash, who appeared on subpœna, admitted a knowledge that his father used his name in his transactions with the defendant Company. His Lordship asked the witness whether his father and Mr. Ashley, the Managing-Director of the defendant Company, were on intimate terms; and he admitted that they "knew each other." Pressed further by the learned Judge, he said that he believed they were on "intimate business terms." Mr. Hugo Young, K.C., who, with Mr. Shakespeare, appeared for the defendant Company, called Mr. Kuhlmei, the London Agent and a Director of the Company, who said he had no knowledge that Mr. Cash had any connection with the plaintiffs. Mr. Richard Ashley, the Managing-Director of the Company, admitted that they had employed Mr. Cash, but said they were unaware that he was debarred by agreement with Mr. Eveson from taking orders for them. In cross-examination, he admitted that he had written business letters to Mr. Cash, and had received letters from him, but had destroyed them. They were brought to the Court for the trial of *Cash v. Eveson*, but they were not wanted, and he afterwards burnt them. His Lordship asked witness why he destroyed them. Witness said he did not think they would be required again. Mr. Lawrence asked witness if he destroyed the Company's property because he thought it would not be wanted again. Witness said the letters had been abstracted from the book; and he could not very well put them back again. He admitted, in answer to a remark by his Lordship, that they could have been kept in a bundle. He also admitted writing a letter to Mr. Carter, the Chairman of his Company, stating that it would be wise for him to say to Mr. Eveson that Mr. Cash had done no business with them for years, though at that time he was aware that he had done business with them previously in some capacity. His object in writing the letter was to shield Mr. Cash, knowing that his action with Mr. Eveson was pending. Sometimes Mr. Cash was paid as much as 15 per cent., while their other travellers had 5 and 2½ per cent. Mr. Lawrence and Mr. Young having addressed the Jury, his Lordship summed up. He recapitulated the evidence, and asked the Jury to say whether they considered that the inference to be drawn from Mr. Ashley's evidence was consistent with his statement that he was not aware of Mr. Cash's agreement with the Eveson Company. After a few minutes' conference, the Jury returned a verdict for the plaintiffs; and his Lordship directed that the question of damages should be referred to Mr. Cave, as Arbitrator.

LIABILITY FOR SUPPLY OF COMPENSATION WATER.

In the "JOURNAL" for the 5th of August last (p. 352), we reported a case tried at the West Riding Assizes, before Mr. Justice Grantham and a Special Jury, in which eight mill occupiers on the banks of the Brow Grains Dike, at Meltham, near Huddersfield, proceeded against the Huddersfield Corporation to recover compensation or penalties for

neglecting to send down a certain quantity of water daily from their reservoir at Blackmoorfoot.

Under their Water-Works Act of 1869, the Corporation were empowered to impound considerable quantities of the water which used to flow into two or three streams, one of them being the Brow Grains Dike, upon the banks of which the mills of the present plaintiffs were built. To compensate the millowners for the water so taken, the Act required the Corporation to return to the stream 951 gallons per minute from the reservoir, failing which they were to be penalized to the extent of £5 per day on every working day on which a shortage occurred. The plaintiffs' case was that during 43 days between Sept. 23 and Nov. 11, 1901, the statutory quantity of compensation water was not sent down by the Corporation; and each of the eight plaintiffs claimed £215. Section 28 of the Act provided that the Corporation should cause to flow from the reservoir to be constructed at or near Blackmoorfoot down a pipe or aqueduct into the Brow Grains Dike, at a point near to and above New Bridge Mill, 951 gallons per minute, from 6 a.m. to 6 p.m. every lawful working day. Section 32 of the Act provided that if there should be any neglect of the Corporation by or in consequence of which any of the several quantities of water from the reservoir should not so flow, they should be liable to the above-named penalty. The plaintiffs alleged that, in consequence of the negligence of the Corporation, the statutory quantity of compensation water did not so flow during the days mentioned; and they each claimed £215, being the aggregate amount of penalties of £5 per day for 43 days. The defendants pleaded several defences to the action. They denied that they had been guilty of negligence, and alleged that the quantity of water required by the Act did, in fact, flow into the dike on the days in question. They further said that if it did not so flow, the deficiency was due to the act of God in causing a drought of exceptional character, which prevented such water flowing as required by the Act. They further denied that the plaintiffs had suffered any damage, and pleaded the Statute of Limitations. They also alternatively pleaded that, on the true construction of sections 28 and 32 of the Act of 1869, they were not liable for more than one penalty in respect of each of the days upon which their alleged neglect caused the deficiency in the statutory amount of compensation water to flow into the dike, and that such penalty was payable either to all the plaintiffs jointly or to the plaintiff or plaintiffs who first sued them; and defendants brought £215 into Court as being sufficient to satisfy the claims of all the plaintiffs in the consolidated actions. At the trial, the Jury returned a verdict for the plaintiffs for the full amount of each plaintiff's claim; and judgment was entered accordingly. From this decision the defendants appealed, on the ground that there was no evidence of negligence on their part; that the learned Judge had misdirected the Jury; and that, on the true construction of the sections of the Act, they were not liable for a larger sum than was paid into Court.

The appeal was recently heard by the Master of the Rolls and Lords Justices Romer and Mathew; and at the conclusion of the arguments the first-named learned Judge gave his decision. He said it was clear that a duty was imposed upon the defendants; and the question was whether the plaintiffs had made out that there had been a breach of it. Their complaint was that the pipe through which the water flowed from the reservoir was of such a character that, if there had been a head of water of more than 11 feet, it would have been adequate for bringing all they were entitled to; when the head was less than 11 feet, it was inadequate. The reservoir was well constructed and of ample size, and the pipe theoretically of sufficient dimensions. The plaintiffs, however, proved that they did not get their proper supply of water, and that the pipe did not do what, if efficient, it should have done. This established a *primâ facie* case against the defendants, which called for an explanation on their part. The plaintiffs also proved that during the period of insufficient supply the defendants were selling water, and thereby diminishing the quantity which would have been otherwise available for their supply. The plaintiffs had called expert evidence at the trial, suggesting that the possible cause of the failure was that the pipe had become obstructed by corrosion or by some kind of deposit, and that iron pipes required reasonable inspection and diligence. Defendants did not call any expert evidence to deny this; and they admitted that no inspection of the pipe had taken place for the thirty years during which it had been in existence. In these circumstances, he thought the appeal must be dismissed. He saw no misdirection by the learned Judge. It was clear, from the express words of section 32, that the penalties were payable to the occupiers of each of the mills affected by the neglect. The Lords Justices concurred; and the appeal was accordingly dismissed, with costs.

Dispute in Regard to a Pipe Contract.

In the King's Bench Division of the High Court of Justice a few days ago, Mr. Justice Bigham had before him, among the commercial cases, an action brought by Messrs. Thomas Allen and Sons, Limited, of Thornaby-on-Tees, against Messrs. Rowland Carr and Co., of Lime Street, E.C. The plaintiffs are manufacturers of cast-iron gas and water pipes, and the defendants are contractors. The former claimed £136 5s. as the balance of the price of goods sold and delivered to the latter, such goods being iron pipes having a diameter of 2 inches. The defence was that not only were the pipes not 2-inch, but were rough, and had projections in the interior. The defendants counterclaimed for £41 damages, because they had to purchase pipes elsewhere. At the close of the evidence, his Lordship said it was clear some slight deviation in size was allowed in the trade. He had come to the conclusion that the pipes in question were not substantially 2 inches in diameter, though they were very near it. They were something short of the $1\frac{15}{16}$ inches which appeared to be the trade minimum for 2-inch pipes, and therefore were not in accordance with the contract. The next question was whether the defendants had accepted the pipes. He was of opinion that they had. There must therefore be judgment for the plaintiffs on their claim for £136 5s. with costs, and for the defendants on their counter-claim with costs, in consequence of the plaintiffs having failed to complete the contract.

MISCELLANEOUS NEWS.

GAS v. ELECTRICITY IN LONDON BOROUGHS.

The St. Pancras Electrical Engineer on Electric and Incandescent Gas Lighting.

At the Meeting of the St. Pancras Borough Council last Wednesday, the Electricity and Public Lighting Committee presented a report, in the course of which they stated that they had had under consideration the question of improving the lighting of the streets in which at present ordinary gas-lamps are in use. In connection therewith, an offer had been made by the Gaslight and Coke Company to replace the whole of the present gas-lamps with an improved lantern and fittings for lighting by the incandescent gas system, on the basis of a charge of £2 per lamp; the cost to be repaid in five years, free of interest. The Committee explained that there are at present about 3113 ordinary gas-lamps in operation; and to replace these by the incandescent system, the capital outlay, on the basis of the above offer, would be £6226, and the annual payment for redemption in five years £1245. The Company further offered to take over the lighting, extinguishing, cleaning, and maintenance of the lamps at a fixed charge of £1 8s. 6d per lamp per annum. In connection with the general question of improved lighting, the Committee stated that they had received a report from the Chief Electrical Engineer (Mr. S. W. Baynes) showing comparisons of cost for lighting the thoroughfares by means of the incandescent gas system, the Kitson light, and by the electric incandescent and arc systems.

Mr. Baynes, in his report, pointed out that there are in the borough a large number of streets available for improved lighting; and assuming it to be determined to put in hand incandescent gas lighting, he recommended the Committee to confine it to streets where at present no electric light mains exist or are contemplated. He said he had been experimenting with incandescent gas-mantles and electric lamps, and submitted the following table showing their candle power:—

Hours Run.	Incandescent Gas.				Nernst Electric Lamp.		
	No. 1.	No. 2.	No.	Mean.	No. 1.	No. 2.	Mean.
0	130	119	127	125·30	123	153	138·0
50	100	107	117	108·00	127	127	127·0
100	100	107	110	105·60	122	122	122·0
150	76	97	102	91·60	73	122	97·5
200	70	55	95	73·30	93	86	89·5
250	..	..	..	..	63	67	65·0
300	..	..	..	..	79	86	82·5
350	..	..	..	..	79	70	74·5
Aver. for 350 hours.	95·2	97	112·2	100·76	94·8	104	99·5

He called attention to the fact that two incandescent burners out of four commenced to collapse in 50 hours, and the remaining two fell off considerably in light-giving power at the end of 200 hours. He went on to say that, in actual practice, on the streets, a gas-mantle showing 120-candle power at the start was tested after 50 hours' burning, and yielded only 80-candle power, or a fall of 40 candles in this short time. With regard to the new Nernst electric glow lamp, he said the average candle power, taken over 300 hours, was about the same as that of incandescent gas; but if the two systems of lighting were put on the streets, under practical working, he expressed the confident belief that the Nernst lamp would yield the greater average candle power. If repayment of capital and interest was taken as usual, the cost per electric lamp per annum would be reduced to £3 16s. 3d. The cost of lighting, cleaning, repairs, and attendance would be less than for gas, as a larger number of lamps could be handled per man. Comparing incandescent gas with arc lighting, he said the figures on the books showed a capital expenditure on the latter of £22 10s. per lamp, which apparently did not include the cost of mains to the lamps; and he estimated that each lamp could be fitted up with its circuit complete for £35. On the assumption that each incandescent gas-lamp cost £2 to erect, and that each arc lamp would displace four, the relative cost of installing would be as £8 is to £35. The cost of maintaining per annum for the arc lamp is:—

Repairs, carbons, &c. (all charges)	£4	14	5
Electricity, at the cost of production . . .	9	18	0
Interest on £35, at 3½ per cent.	1	4	6
Sinking fund, 1-42nd of £35, say	0	17	0
Total	£16	13	11

The annual cost of maintaining four incandescent gas-lamps would be (say) £16. In dealing with the arc lamp costs, the capital expenditure is repaid in 42 years, and the interest is taken at 3½ per cent.; these being the terms on which money for electric lighting is dealt with. But to obtain a fair comparison between the two (gas and electricity), Mr. Baynes said the £4 per gas-lamp must be adjusted accordingly, making £3 15s. per lamp, or £15 per annum for the maintenance of the four gas-lights. Thus we have the cost of gas (four lamps, total candle average 320), £15 per annum; cost of arc lighting of 1000-candle power, £16 13s. 11d. per annum. Mr. Baynes obtained the following figures in regard to the Kitson light, which he said would give the Committee some idea of its relative cost in comparison with the other illuminants he had referred to: Capital outlay per lamp complete, £40; cost of maintenance, from £16 to £17 per annum, or with interest and sinking fund (£2 7s.) from £18 7s. to £19 7s. per annum per lamp. He added that one-third more candle power than the arc light was claimed for this expenditure. After a few remarks on the competition of gas with electricity, Mr. Baynes concluded by proposing that the Committee should light all streets having distributing mains by electricity, and streets wherein distributing mains are

not likely to be laid by incandescent gas. Having regard to the yearly fall in the cost of production, it was safe, he said, to assume that, even at the low figure proposed, they would eventually derive a profit from the arc lighting extensions.

The Committee recommended that incandescent gas lighting should be adopted in all the public lamps of the borough at present lit by the ordinary gas-burner. Alderman Smith called attention to the fact that on the 27th of February last year the Council resolved, on the recommendation of the Committee, that 135 streets set out in their report should be lighted with arc lamps as soon as sufficient power was available; and that, in anticipation of this event, arc lighting mains had been laid in 40 streets in the borough to the extent of 14,055 yards, involving an expenditure of £4218 9s. 6d., and were not at present being used. He moved, as an amendment—"That the Electricity and Public Lighting Committee be empowered to light with incandescent gas the side streets of the borough, excluding those comprised in the scheme of February, 1901, which should be proceeded with as rapidly as possible." After some discussion, the consideration of the whole subject was adjourned until after the Christmas holidays.

Incandescent Gas Lighting for Hackney.

At the Meeting of the Hackney Borough Council last Wednesday, the following report was presented by the Electric Lighting Committee on the subject of the improvement of the lighting of the roads and streets within the borough in which electric distributing mains have not been laid:—

Your Committee have for a considerable period had under consideration the desirability of the adoption of an improved method for the lighting of those roads and streets of the borough in which electric distributing mains have not been laid, and in which lighting by gas may probably be continued for some years to come. It has been felt that full advantage has not been taken of the great improvements which have of late been developed in systems of lighting by gas, and that it is possible that a much more efficient method of lighting may be obtained at practically no increase of cost. By the instructions of the Committee, the Borough Surveyor [Mr. Norman Scorgie] has made considerable inquiry on the subject, and has presented to the Committee several reports, in which the results of his investigations have been embodied. One of these shows that, based on the present price of gas, the annual cost of a lamp fitted with an ordinary flat-flame burner, such as is the case with most of the lamps in the borough, is £3 5s. 7d.; a light of about 12-candle power being obtained. But, by the use of an incandescent No. 3 Kern burner, a light averaging 50-candle power can be obtained at a cost of £2 17s. 11d. per annum; and by the use of a No. 4 Kern burner, a light averaging 75-candle power can be obtained at a cost of £3 7s. 6d. per annum. In the judgment of your Committee, the No. 3 Kern burner is sufficient for the lighting of streets of ordinary width and traffic; but in streets of greater width or traffic a No. 4 Kern burner is desirable. The cost of the new lantern, fittings, &c., which will be necessary in each case where a lamp is fitted with an incandescent light in place of an ordinary flat-flame burner will be £2 2s.; but the Gaslight and Coke Company are prepared (subject to an order for at least 200 lamps being given at one time) to accept the payment of this amount, without any further charge for interest, in equal quarterly instalments spread over a period of five years—the payment thus being at the rate of 8s. 5d. per year for five years. Add this to the £2 17s. 11d., the annual cost of the lighting and maintenance, and it will be seen that for five years the total annual cost—£3 6s. 4d.—will be only 9d. per lamp over the present cost of the flat-flame lamps, while at the end of the five years the cost will fall to 7s. 8d. below that of the present flat flame burner; a light being obtained at the same time of a candle power equal to 316 per cent. above that of the present flat-flame burner. In the cases of the wider roads, where a No. 4 Kern burner may be adopted, the cost will be £3 15s. 11d. per annum for the first five years, and afterwards £3 7s. 6d. per annum, or 10s. 4d. per annum above for the first five years, and afterwards 1s. 11d. per annum above, the present cost of the flat-flame burner; for which extra payment a light will be obtained of a candle power equal to 525 per cent. above that of the present flat-flame burner. . . . The advantages of the substitution of incandescent burners in place of the ordinary flat-flame burners in those roads which are at present lighted by gas, and where electric distributing mains have not been laid, appear to your Committee to be thus so obvious that they beg to recommend—"That the system of incandescent lighting by the No. 3 Kern burner, or other burner of an equivalent power, and not consuming more gas, be adopted in lieu of the present flat-flame burners in those roads and streets of the borough in which electric distributing cables have not been laid, with power to the Committee to adopt the No. 4 Kern burner in such of the aforesaid roads and streets as may seem to the Committee to be advisable, by reason of exceptional width or extent of traffic."

The report was adopted.

A Great Improvement in Chelsea.

The Gaslight and Coke Company have recently carried out for the Borough Council of Chelsea a considerable improvement in the lighting of the main thoroughfare of that parish, which is so much of the King's Road as lies between Sloane Square and the Chelsea Station of the West London Extension Railway. The improvement has also been extended south from Sloane Square, down Lower Sloane Street to the parish boundary at Chelsea Hospital. Throughout this length of thoroughfare, which forms part of the principal omnibus route from Fulham to Westminster, the previously existing single-burner lanterns have been removed, and in substitution new 18-inch "Windsor" lanterns, each fitted with two No. 4 Welsbach burners, with anti-vibrators, have been fixed. The lamps in Sloane Square, which is a large open space, have (with the exceptions mentioned below) been similarly treated. In addition to these improvements, the Council have had fixed in some of the most prominent positions along the route about a dozen Scott-Snell lamps, notably half-a-dozen in different parts of Sloane Square, which give to what was an ill-lighted space a splendidly illuminated appearance. Some single-burner incandescent lamps have been fixed in a few of the side thoroughfares; and, so far as they have gone, the improvement in the lighting of the streets has given considerable satisfaction in the borough.

THE LONDON COUNTY COUNCIL AND GAS TESTING.

Gas Testing on Sundays and Bank Holidays.

At the Meeting of the London County Council on Tuesday last—Sir JOHN M'DOUGALL in the chair—the above subject was once more referred to.

Colonel ROTTON asked the Chairman of the Public Control Committee if full explanation had been given by the South Metropolitan Gas Company of the difficulties caused by the entire cessation of gas making during 12 and often 16 hours on Sundays, in order to give their stokers the day's rest; if a letter, dated the 22nd of July last, had been sent to the Company by the Council's Solicitor, saying that the Council would in this case adopt the suggestion of the Company, and allow the matter to be mentioned to Lord Rayleigh (the Chief Gas Examiner for the Metropolis) as practically not needing his adjudication; and if the Committee had been in any way misled by a statement made in the Council on the 18th ult., by Mr. Johnson, the ex-Chairman.

Mr. R. MELVILL BEACHCROFT wished to know whether legal proceedings had already been commenced against the Company for refusing to allow Sunday testing, and whether these proceedings would continue during the recess.

Mr. W. J. SQUIRES (the Chairman of the Public Control Committee) replied, with reference to the questions asked by Colonel Rotton as to the testing of gas of the South Metropolitan Company, that this was a most unfortunate case. He had seen the circular-letter which Colonel Rotton had mentioned, but it had only been issued to members of the Council since the last meeting of the Public Control Committee; and he regretted very much, as Chairman of that Committee, that such steps should have been taken. When the Chairman of the South Metropolitan Gas Company was at the meeting in the committee-room, it was taken that he agreed, almost as the Public Control Committee had suggested, that the only solution of this difficulty was to test the matter by law. Then, in reply to the question asked by Mr. Beachcroft as to whether legal proceedings had been commenced against the Company, he said he had not had the opportunity of knowing that this question was going to be put, or he certainly should have been able to answer it. He believed the matter was to go forward, even during the recess, because he thought the sooner the decision on this point was known the better it would be for everyone concerned.*

Colonel ROTTON pointed out that the Chairman of the Committee had not answered his question with reference to the letter sent by the Council's Solicitor on the 22nd of July last, saying that, under certain circumstances, no further proceedings were going to be taken; and he also asked whether the speech made in the Council Chamber last month by the former Chairman of the Public Control Committee had in any way misled the Committee. He thought, in fairness to that gentleman, this question should be answered.

Mr. SQUIRES said he regretted he had overlooked that point in Colonel Rotton's question; but he was not in a position to say anything as to the particular letter mentioned. He had stated clearly what had taken place between the Chairman of the South Metropolitan Gas Company and the Public Control Committee as lately as last Friday week. With regard to what the former Chairman of the Committee had said in the Council, he thought this was a matter for Mr. Johnson himself to answer.

Mr. W. C. JOHNSON said he desired to take the opportunity of making some reply to the letter of the South Metropolitan Gas Company, which had been circulated to each member of the Council; and he was very much obliged to Colonel Rotton for bringing the subject forward. There was a statement in this letter that the Council were probably misled by wholly erroneous statements made by himself. He wished to know what authority the Gas Company had for calling them "erroneous statements." The only report he could see was the one in the "JOURNAL OF GAS LIGHTING," which, by the way, referred to the speech previous to his in the debate as the "graceless behaviour of the man Ward." That report consisted of about 30 lines, and with every word of it, with the exception of half-a-line, he was in entire agreement as being absolutely accurate. That one line—he did not know whether he himself was responsible for it or the reporter—stated that the Company were brought before the Magistrate. That was not right. The Council did not bring the Company before any authority; it was the Company who appealed against the decision of the Council. The appeal was not to a Magistrate, but to the Chief Gas Examiner. With this very slight correction, the statement he made he believed to be absolutely correct; and he entirely repudiated the accusations of the Company that he had in any way misled the Council. He wrote to the Secretary stating that, as the matter might be referred to in debate that day, and as that was the last meeting of the Council before the recess, he would be glad if he would inform him to what statement of his the Company took exception; and he merely replied that he would bring the letter before the Directors on Wednesday. Of course, a charge of that kind, made against him specifically as the ex-Chairman of the Committee, was one that he ought to repudiate, and repudiate warmly. If the Company, in sending this letter to his colleagues, had any justification for saying that his statement was wholly erroneous, he thought the least they could have done would have been at once to have pointed out the part to which they took exception. They had not done so. He adhered to everything he had said, and he would like to add, in conclusion, that if there had been any misrepresentation at all in this matter, t was contained in the letters of the Gas Company to the Public Control Committee

* The matter was to have come before Mr. Justice Kekewich on Friday; but it stands over till next sittings.—ED. J.G.L.

WELLINGTON (SALOP) GAS SUPPLY.

Proposed Purchase of the Gas-Works by the District Council.

A Special Meeting of the Wellington (Salop) Urban District Council was held a few days ago, to consider the Wellington (Salop) Gas Bill, and to take such steps as might be thought necessary with regard to it. The Chairman of the Council (Dr. Hollies) presided. He said they had not a copy of the Bill before them; but as the matter had been twice advertised in statutory form, it had been brought within the range of practical politics, so far as they were concerned. The action of the Gas Company suggested to his mind that they had come to the present limit of their powers, and that they wished to obtain others which would afford them greater facilities for development. It was an important matter; and in its present stage he thought it ought to be discussed in Committee. He proposed that it should be so discussed. The motion was carried; but it was agreed that any resolution arrived at should be supplied to the Press. In Committee, the Chairman described the position of the Company and the scope of the proposed Bill as it affected the urban district of Wellington, and a discussion took place. Eventually, it was resolved that the Council should promote a Bill for the compulsory purchase of the Company's undertaking, and that the Clerk should take the necessary steps in the matter. A Committee was formed to act on behalf of the Council.

PROVINCIAL RATES AND GAS, ELECTRICITY, AND WATER CHARGES.

We have received from Mr. James Carter, the Borough Treasurer of Preston, a copy of his tabulated statistics of the rates levied and collected, and the charges made for gas, electricity, and water, in a number of provincial towns, for the year 1902-3. There are 76 places in all; being an increase of one on last year's list (noticed in the "JOURNAL" for Dec. 10, 1901), and of four on the list for 1900-1. The new-comers are Lincoln and Swansea; but Sheffield drops out. The populations range from 692,495 (Liverpool) down to 20,288 (King's Lynn); the rateable values being highest in the first-named place (£4,114,875), and lowest at Stafford (£77,321). The places which are most heavily rated are West Ham, 10s. 2d.; East Ham, 9s. 6d.; Stafford, 9s. 1d.; Rotherham and Wakefield, 9s.; Wolverhampton, 8s. 10d.; Dewsbury, 8s. 3d.; Halifax and Middlesbrough, 8s. 2d.; and Southampton, 8s. 1d. Those which have the lightest rates are Lancaster, 4s.; Southport, 4s. 4d.; Blackpool and Bournemouth, 4s. 8d.; and Barrow-in-Furness and St. Helens, 5s. Out of the rents of property and profits transferred from municipal undertakings, Darlington relieves the rates to the extent of 1s. 7d. in the pound; Nottingham coming next with 1s. 3¼d. and Carlisle with 1s. Halifax figures for ¼d., Cheltenham for ½d., Eastbourne and West Hartlepool for ¾d., and South Shields for 1d. The highest net charge per 1000 cubic feet for gas is at King's Lynn, 3s. 6d. Last year this position was shared by Norwich; but in that city the figure is now 3s. 3d. There are only eleven towns in the list where the price is 3s. and upwards. At Bury and Sunderland, it is 1s. 11d.; at Newcastle and Gateshead, 1s. 10½d.; and at Plymouth, 1s. 9d. As before, Widnes is conspicuous for being supplied with the lowest priced gas—the average charges being given by Mr. Carter as 1s. 4d. per 1000 cubic feet. The rates for electricity ranged from 7d. down to 2⅜d. (Sunderland) per Board of Trade unit. The charge for water for domestic purposes on a house of £15 rateable value, is highest at Bury and Rochdale, 2s. in the pound; the rate being levied in the latter place on the gross rental. It is lowest in Southampton, 6d. in the pound, compared with 1s. in last year's list. The southern town has taken the place formerly occupied by the city on the Mersey, whose charge is 7½d., as before. The other towns where the charges are less than 1s. in the pound are Birkenhead, Bootle, Brighton, Bournemouth, Leamington, Manchester, Plymouth, Preston, Reading, Salford, South Shields, and Widnes.

REPAYMENT OF LOANS BY LOCAL AUTHORITIES.

Special Acts versus Provisional Orders.

Among other matters coming up for consideration at the meeting of the Barnsley Town Council last Tuesday, was the desirability of promoting a Bill in Parliament to amend the provisions of the Barnsley Order, 1902, and for other purposes. The Mayor (Alderman W. E. Raley, J.P.), in introducing the question, explained that a short time ago, in connection with the Midhope water scheme, the Council found it necessary to apply for a further loan of £113,000, in addition to the £170,000 already borrowed; but, in order to save expense, they decided to apply to the Local Government Board for a Provisional Order for power to borrow the money, rather than promote a new Act of Parliament. However, when the Order came down, instead of the period during which the capital would be repayable being 60 years, as provided by their Act, it was, in respect of the extra loan, reduced to 30 years. The Council felt that, considering the money was required for the extension of work already in progress, the same period for repayment should be allowed. Mr. Joseph Walton, M.P., and the Town Clerk saw the President of the Local Government Board, but did not make much impression upon him, for in a subsequent letter he stated that he was unable to grant a longer period than 35 years. In this letter, reference was made to a Select Committee of the House of Commons who had recently sat on the question of repayment of loans by local authorities, and who had adopted the principle that the only sound financial system was that which made each generation to a considerable extent pay its own way. In the present instance, great

GAS AND WATER COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 1682.

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.	GAS COMPANIES.			£ s. d.
590,000	10	Oct. 15	10½	Alliance & Dublin 10 p.c.	18—19	..	5 10 6
100,000	10	,,	7½	Do. 7 p.c.	12½—13½	..	5 11 1
300,000	100	July 1	5	Australian 5 p.c. Deb.	100—102	..	4 18 0
200,000	5	Nov. 13	6⅜	Bombay, Ltd.	5⅞—6	..	5 8 4
40,000	5	,,	6½	Do. New, £4 paid	4—4½	..	5 15 6
380,000	Stk.	Aug. 14	12	Brentford Consolidated	247—252	..	4 15 3
270,000	,,	,,	9	Do. New	180—185	..	4 17 3
50,000	,,	,,	5	Do. 5 p.c. Pref.	134—139	..	3 11 11
206,250	,,	Dec. 11	4	Do. 4 p.c. Deb.	110—113*	..	3 10 19
220,000	Stk.	Sept. 11	10⅝	Brighton & Hove Orig.	207—212	..	5 1 5
246,320	,,	,,	7⅛	Do. A. Ord. Stk.	152—157	..	4 18 9
460,000	20	Sept. 26	10	British	39½—40½	..	4 18 9
50,000	10	Aug. 14	12	Bromley, Ord. 10 p.c.	22—24	..	5 0 0
82,850	10	,,	9	Do. 7 p.c.	18—20	..	4 10 0
500,000	10	Oct 15	7	Buenos Ayres (New) Ltd.	10—10½	..	6 13 4
250,000	Stk.	June 24	4	Do. 4 p.c. Deb.	94—96	..	4 3 4
150,000	20	July 11	8½	Cagliari, Ltd.	23—25	..	6 12 0
100,000	10	Sept. 26	10	Cape Town & Dis., Ltd.	14⅛—15⅛	..	6 9 0
50,000	50	Nov. 3	6	Do. 6 p.c. 1st Mort.	53—55	..	5 9 1
550,000	Stk.	Oct. 15	12½	Commercial Old Stock	250—260	..	4 16 2
251,875	,,	,,	9⅜	Do. New do.	200—205	..	4 12 8
271,875	,,	Dec. 11	4½	Do. 4½ p.c. Deb.	130—134*	..	3 7 2
800,000	Stk.	Dec. 11	8	Continental Union, Ltd.	133—138*	..	5 15 11
200,000	,,	,,	7	Do. 7 p.c. Pref.	140—145*	..	4 16 7
575,000	Stk.	Aug. 28	5⅛	Crystal Palace Ord. 5 p.c.	117—122	..	4 7 4
60,000	,,	,,	5	Do. 5 p.c. Pref.	120—125	..	4 0 0
106,158	,,	July 11	5	Do. 5 p.c. Deb. Stk.	139—142	..	3 10 5
486,090	10	July 30	10½	European, Ltd.	18—19	..	5 10 6
354,060	10	,,	10½	Do. £7 10s. paid	13—14	..	5 12 6
15,243,200	Stk.	Aug. 14	4	Gas- 4 p.c. Ord.	81—85	..	4 13 0
2,600,000	,,	,,	3½	light 3½ p.c. max.	86—88	— 1	3 19 7
3,799,735	,,	,,	4	and 4 p.c. Con. Pref.	110—112	..	3 11 5
4,193,975	,,	Dec. 11	3	Coke 3 p.c. Con. Deb.	91—93*	..	3 4 6
70,000	10	Oct. 30	8	Hongkong & China, Ltd.	14½—15½	..	5 3 3
3,800,000	Stk.	Nov. 13	10	Imperial Continental	201—204	..	4 18 0
473,600	Stk.	Aug. 14	3½	Do. 3½ p.c. Deb. Red.	99—101	..	3 9 4
561,000	Stk.	Aug. 28	10	Liverpool United A	223—225	..	4 8 11
718,100	,,	,,	7	Do. do. B	165—167	..	4 3 10
306,083	,,	June 24	4	Do. do. Deb. Stk.	116—118	..	3 7 10
75,000	5	Dec. 11	5	Malta & Medn., Ltd.	4—4⅛*	..	5 11 1
560,000	100	Oct. 1	5	Met. of 5 p.c. Deb.	104—108	..	4 12 7
250,000	100	,,	4½	Melbourne 4½ p.c. Deb.	102—104	..	4 6 7
541,920	20	Nov. 13	3½	Monte Video, Ltd.	9—10	..	7 0 0
1,515,892	Stk.	Aug. 8	4½	Newc'tle & G'tesh'd Con.	104—105	..	4 5 9
346,855	Stk.	July 4	3½	Do. 3½ p.c. Deb.	99—100	..	3 10 0
300,000	Stk.	Nov. 27	8	Oriental, Ltd.	140—145	..	5 10 4
60,000	5	Sept. 26	7	Ottoman, Ltd.	6½—7	..	5 0 0
					* Ex div.		
851,070	10	Oct. 15	7	River Plate Ord.	10—10¾	..	6 13 4
300,000	Stk.	June 24	4	Do. 4 p.c. Deb.	94—96	..	4 3 4
250,000	10	Sept. 26	8	San Paulo, Ltd.	11⅛—12⅛	..	6 8 0
135,000	Stk.	Sept. 11	10	Sheffield A	236—238	..	4 4 0
209,984	,,	,,	10	Do. B	235—237	..	4 4 5
523,498	,,	,,	10	Do. C	233—235	— 1	4 5 1
6,000,000	Stk.	Aug. 14	5⅜	South Met., 4 p.c. Ord.	110—119	..	4 9 6
1,760,000	,,	July 11	3	Do. 3 p.c. Deb.	92—94	+ 1	3 3 10
380,940	Stk.	Nov. 13	5	Southampton Ord.	103—107	..	4 13 6
87,950	,,	July 11	4	Do. 4 p.c. Deb.	102—105	..	3 16 2
120,000	Stk.	Aug. 28	6	Tottenham and Edmonton A. 5 p.c. / B. 3½ p.c.	118—123 / 93—96	.. / ..	4 17 7 / 4 13 9
302,520	,,	,,	4½				
182,380	10	Jan. 16	5	Tuscan, Ltd.	8—9	..	5 11 1
149,900	10	July 1	5	Do. 5 p.c. Deb. Red.	96—98	..	5 2 0
230,000	5	Aug. 14	5½	West Ham, 10 p.c.	10—11	..	4 6 4
172,000	10	,,	6½	Do. 7 p.c.	13½—14½	..	4 9 8
				WATER COMPANIES.			
780,662	Stk.	June 24	11⅝	Chelsea, Ord.	315—325	— 5	3 10 9
150,000	,,	,,	5	Do. 5 p.c. Pref.	152—157	..	3 3 8
160,000	,,	,,	4½	Do. 4½ p.c. Pref. '75	140—145	..	3 2 1
175,785	,,	Sept. 26	4½	Do. 4½ p.c. Deb.	140—145	..	3 2 1
1,720,560	Stk.	Oct. 15	8	East London, Ord.	225—235	— 5	3 8 2
654,740	,,	Dec. 11	4½	Do. 4½ p.c. Deb.	142—147*	..	3 1 3
1,282,913	,,	,,	3	Do. 3 p.c. Deb.	96—98*	..	3 1 3
700,000	50	Dec. 11	8	Grand 10 p.c. max.	113—118*	— 2	3 7 10
310,000	Stk.	Sept. 26	4	Junction 4 p.c. Deb.	125—130	..	3 1 7
708,000	Stk.	Aug. 14	14	Kent	300—310	..	4 10 4
160,000	,,	,,	7	Do. New, 7 p.c. max.	220—230	..	3 6 8
1,043,800	100	June 24	11	Lambeth, 10 p.c. max.	310—320	..	3 8 9
406,200	100	,,	8½	Do. 7½ p.c. max.	225—235	..	3 8 2
350,000	Stk.	Sept. 26	4	Do. 4 p.c. Deb.	125—130	..	3 1 7
500,000	100	Aug. 14	12⅝	New River, New Shares	393—405	..	3 3 2
1,000,000	Stk.	July 30	4	Do. 4 p.c. Deb.	125—130	..	3 1 7
902,300	Stk.	Dec. 11	7	South-wark Ord. / 7½ p.c. max. / and 5 p.c. Pref.	205—210* / 195—205* / 151—154*	— 2 / .. / ..	3 6 8 / 3 8 4 / 3 4 11
126 500	100	,,	7				
489,200	Stk.	,,	5				
1,019,585	,,	Oct. 15	4	Vauxhall 4 p.c. A Deb.	125—130	..	3 1 7
1,155,066	Stk.	Dec. 11	10	West Middlesex	295—305*	..	3 5 7
200,000	,,	,,	4½	Do. 4½ p.c. Deb.	140—145*	..	3 2 1
200,000	,,	Sept. 11	3	Do. 3 p.c. Deb.	97—99	..	3 0 7
					* Ex div.	..	

expense had been incurred for the benefit of the out-townships; and it was not a case of the present generation benefiting. The future generation would get the benefit of the present expenditure. After twenty years the Midhope reservoir would be bringing in a profit; but for a long time they would have to supplement it from the accumulated profits from the Ingbirchworth works. They therefore claimed that the loan should be spread over the original term, for the difference in the two periods would mean £1200 a year. The Council felt they ought to make an effort to alter this. They had done their best; but having failed with the Local Government Board, they proposed to promote a Bill to get the term of repayment fixed at 60 years. This course was unanimously agreed to.

ELECTRIC LIGHTING NOTES.

A Deadlock at Tipton.

A peculiar difficulty has arisen between the Tipton District Council and the Midland Electrical Corporation. An agreement was entered into by which the Corporation undertook to supply the Council in bulk; the latter considering they were free to supply private consumers. The Corporation have put an entirely different construction on the agreement, which they contend had reference to supplying the Council only; and as they have a Bill enabling them to supply ordinary consumers, they decline to allow the point to go to arbitration.

Lighting of Brixham.

A meeting of the ratepayers of Brixham was called for the purpose of deciding whether, under the circumstances, it was desirable for the District Council to carry out an electric lighting scheme of their own. According to an Engineer's estimate which was laid before the meeting, the cost of the works would be £9129; and if 60,000 units, at 5½d. per unit, were sold per annum, there would be a net profit of £150. Negotiations had also been opened with the Gas Company, though the report stated that the District Council approached this question with some diffidence, knowing that there was a decided antipathy on the part of ratepayers to any steps being taken in that direction. Subject to the shareholders agreeing, the Gas Company had offered their undertaking to the Council on the basis of £12 per share. The share capital consists of 202 £10 shares (£8 paid) and 60 £10 shares fully-paid. The price for the concern worked out at £3146, as compared with £5000. The Council were of opinion that, if purchased at the price now offered, the gas-works would yield a good profit in relief of the rates, besides allowing a substantial reduction of the present price of gas, which is 4s. per 1000 cubic feet. In the course of the discussion, several ratepayers laid stress on the need of better lighting of the harbour; and it was said that, for this reason, many fishermen were in favour of an electric lighting scheme, regardless of the cost. Two or three speakers advocated the purchase of the gas-works; and several opposed the proposal to provide electric lighting works by the Council, on the ground that it was too large and risky a scheme to undertake. In the end, it was decided to proceed with Messrs. Crompton's scheme if possible.

Transfer of Provisional Orders.

In connection with the schemes which are on foot in the West of England for the inauguration of electric lighting undertakings by arrangement between the local authorities and various electric lighting companies, an important point has been raised. One of the places with which negotiations have been opened is Brixham, the little fishing town on the western shore of Torbay. The District Council were invited to obtain a Provisional Order and let it to Messrs. Crompton and Co.—a firm who have made similar arrangements with several towns in Devon, and who agreed to erect and carry on electric lighting works and pay the District Council £35 a year. During the negotiations, attention was drawn to the second part of section 11 of the Electric Lighting Act, 1882, which prohibits a local authority which has obtained an Order from transferring any of its powers under the Order except with the consent of the Board of Trade. Counsel's opinion confirmed that of the Clerk to the District Council, that this section was operative; and it was proposed that a clause should be inserted in the agreement with the Company requiring that the Board of Trade's consent should be obtained to the proposed arrangement. Messrs. Crompton and Co., however, argued that permission from the Board of Trade was not required; and they would not consent to insert the clause. The Board of Trade were consulted on the matter, and stated that up to about 1899 they had been in the habit of allowing the undertakers to transfer their powers to a company. Since then, however, they had always refused to give their assent to any Provisional Order that had not the proviso of section 11 contained in it; and they certainly would not consent in this case. In a report on the subject which was presented by the Clerk to a meeting of the Brixham ratepayers on Tuesday last, it was said that the Board of Trade's view practically was that the people who obtain the Order must do the work. How this will affect the numerous agreements which have been concluded with other towns in the West remains to be seen.

CHELSEA WATER-WORKS COMPANY.

The Half-Yearly General Meeting of this Company was held at their Office, Commercial Road, Pimlico, on Thursday last, under the presidency of Mr. Francis Stephen Clayton.

The Secretary (Mr. G. H. Gill) read the notice calling the meeting and the report of the Company's Auditors, who stated that they had great pleasure in expressing their entire satisfaction with the clear and precise way in which the accounts had been kept.

The Governor, in moving the adoption of the report, stated that the passage of the London Water Bill through Parliament had been

Advertisement of the Richmond Gas Stove and Meter Company, Limited.

the chief event of the past half year. In other respects, the Company had had a very quiet time. The result of the half-year's accounts was very satisfactory, and fully justified the Directors in recommending a dividend on the ordinary stock at the same rate as was paid last July—namely, 11½ per cent. The amount applicable to dividend upon the ordinary stock, after providing the dividends on the preference and debenture stocks, was £86,327; and after deducting £44,946 for the dividend on the ordinary stock, the substantial sum of £41,381 would remain to be carried forward. This was a highly satisfactory state of things. The proprietors would have observed that £1603 had been debited to the contingencies fund account—the amount representing the expenses incurred by the Company in opposing the London Water Bill before the Joint Committee of the Houses of Parliament. This sum had been charged to the contingencies fund because, in the opinion of the Directors, it would have been unfair to debit such a very special item of expenditure against the half-year's revenue. The expenditure on capital account during the half year had been £1190. The quantity of water pumped during the six months had been 2439 million gallons; being a decrease of 107 millions compared with the corresponding period of last year, owing chiefly to the wet summer. A saving of £1012 had been effected in the cost of pumping, due in a small measure to the lesser quantity of water pumped, but principally to the substantial reduction in the price of coal under the existing contract. There had also been an increase of £1252 in the water-rental as compared with that for the corresponding period of 1901. During the half year, 261 new supplies had been laid, which were estimated to produce an increased water-rental of £1068; while 195 houses had been pulled down for improvements, representing a temporary loss of income of £444. The proprietors were therefore to be congratulated on the satisfactory result of the half-year's working, especially on the substantial increase in the water-rental, notwithstanding the fact that a large number of houses had been pulled down, and that the past summer had prejudicially affected the revenue derived from meter supplies. With regard to the London Water Bill, he supposed that in the course of a very few hours it would receive the Royal Assent. The Companies, as the proprietors were aware, opposed the Bill before the Joint Committee with a view to obtaining certain amendments therein in their own interest. These efforts, however, met with only partial success; but it was useless to dwell on that subject. The Companies must accept the situation frankly, and make the best of it. It would be impossible to forecast the course of procedure of the Water Board when formed. Probably some months would elapse before the new body would get into working order. In the meantime, the proprietors might rest assured that the Directors would not be idle. They must be prepared for any eventuality, and they would be diligent in getting up their case to the best of their ability. It might interest the proprietors to be reminded that their Company was established by Royal Charter on March 8, 1723, being the ninth year of George I.; and the Charter was followed by several Acts of Parliament. The Company still retained their original title and designation—namely, "The Governor and Company of Chelsea Water-Works." In point of seniority, they ranked next to the New River Company. For many years they had had a somewhat checkered career—in fact, it was only during the last 45 or 50 years that Fortune had smiled upon them, and they were now in the happy position of paying a dividend of 11½ per cent. on the ordinary stock. Their district was situated entirely in the Metropolitan area. The only undeveloped part was in Fulham, which in a few years would be covered with houses; this would add considerably to the water-rental. Another element of value was the constant improvement of the district by the displacement of old houses for new ones of a better class; this was especially the case in Westminster and Chelsea. Another valuable asset lay in the fact that the Company possessed the right to take 22 million gallons of water per day from the Thames. At present, the average quantity taken was between 12 and 13 million gallons. When the vacant land in Fulham was built over, probably another million would be required, which would leave a margin of 8 or 9 millions for any future developments. This was a very satisfactory state of things. It was for this reason that the Company did not join in the costly scheme of impounding reservoirs at Staines. The Company, in fact, possessed a very valuable property; and the proprietors might rest assured that the Directors would do their utmost to obtain the best possible price for it. The Board were fortunate in having in Mr. Gill a most efficient and zealous Secretary, whose services would be invaluable to them at the present juncture. He was ably seconded by the Assistant-Secretary and staff; and the Engineer and his assistants would also, he was convinced, render the Company excellent service.

The DEPUTY-GOVERNOR (Mr. Jackson Hunt) seconded the motion, which was carried unanimously; and resolutions were afterwards passed approving the dividends recommended,

Mr. JOHN DREW proposed a vote of thanks to the Governor and the Directors, whose work, he remarked, was not over yet—indeed, the most important part of it had probably still to come. He did not think that any of the other Companies could present so good a case as the Chelsea Company could; but he believed that there was a disposition to treat them reasonably and fairly.

General NEWTON BARTON seconded the motion, which was carried unanimously.

The GOVERNOR, in reply, stated that the vote would be an additional incentive to the Directors to continue to do their best in the interests of the Company. A very anxious time was before them; but he hoped and could not doubt that they would be equal to the occasion, as they had been in the past.

On the motion of Mr. DREW, seconded by Mr. CROZIER, and supported by the GOVERNOR, a hearty vote of thanks was also accorded to the officers of the Company.

The SECRETARY briefly replied, warmly acknowledging the considerate treatment which the staff had always received at the hands of the Directors.

The proceedings then terminated.

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The **"St. Patrick"** Gas Radiator guaranteed odourless.

JOHN WRIGHT & Co., ESSEX WORKS, BIRMINGHAM.

INCREASE IN WATER CHARGES AT RAWMARSH.

The Rawmarsh Urban District Council have applied for a Provisional Order to partially repeal, alter, or amend the Rotherham and Kimberworth Local Board Health Act, 1870, so far as that Act is in force in their district, for the purpose of enabling them to increase the maximum rates, rents, and sums authorized to be charged for a supply of water for domestic and other purposes; and accordingly a Local Government Board inquiry was held last Wednesday by Mr. E. P. Burd. From the statement of the Clerk (Mr. J. W. Bellamy), it appeared that in the year 1870 the Rotherham and Kimberworth Local Board of Health obtained an Act empowering them to supply water in bulk to the Rawmarsh Local Board, whose parish is situate 2½ miles to the north of the county borough of Rotherham; the supply to be subject to an agreement to be mutually entered into between the Authorities. Under this agreement, Rotherham undertook to supply Rawmarsh with water at 6d. per 1000 gallons "for ever." Between the years 1878 and 1890, many complaints were made by Rawmarsh as to the impurity of the water supply and the polluted sources from which it was obtained; and their Medical Officer of Health made a special report to the Local Government Board fully stating facts within his own knowledge, and showing that an increased death-rate was traceable to them. The Local Government Board were so convinced of the seriousness of the report, that they instructed Dr. Theodore Thomson to visit the gathering grounds from which the water was obtained; and subsequently he made a very exhaustive examination, and reported results. In consequence of this report, the Rotherham Corporation cut off part of their suspected supply, and began to look round for a less objectionable source. Nothing definite, however, was done until 1896, when Rotherham made arrangements with the Sheffield Corporation to secure water of a better quality; and, subsequently the Derwent Valley Water Board, in which Sheffield was a partner, was formed. Rotherham therefore became in this way entitled to an abundant supply of pure water from Sheffield, and, having got into this position, obtained an Act by which they secured a modification of the agreement referred to above. After several interviews between the two Authorities, it was arranged that a fresh agreement should be entered into whereby Rawmarsh agreed to pay to Rotherham an increase in the price of water representing 25 per cent. advance upon the old rate. Under these altered circumstances, the Council were advised that it would be necessary to revise the present scale of water charges. He then submitted the new scale, from which it appeared that the largest increase was in the case of houses rated under £7. Speaking generally upon the increase of cottage property, he believed that nearly all the owners at present charged 3d. per week in the rent for water. The total amount of the increase of 25 per cent. upon the old scale would be about £645, which, added to the sum the Council were now paying to Rotherham—viz., £2581—would equal £3226, *plus* distribution charges £542, making an annual total of £3768. The rental under the proposed new scale would amount to £2915, thus leaving a deficiency of £853 per annum to be a charge on the general district rate. The deficiency last year was £803.

EXTENSION OF THE TORQUAY WATER-WORKS.

A Special Meeting of the Torquay Town Council was held last Tuesday to consider the Bill which the Corporation purpose introducing next session by which power is sought to construct an additional reservoir in the Trenchford Valley at a cost of £22,000. Alderman Bovey moved, and Colonel Appleton seconded, a resolution approving of the promotion of the Bill. Mr. Barker proposed the omission of part of clause 64, providing that repayment of the capital should be suspended for ten years, the effect of which, he said, would be to reduce the actual period of repayment from 60 to 50 years. The Town Clerk (Mr. F. S. Hex) explained that the intention was to ask for 60 years from the time when repayment began, so that the whole period would be 70 years instead of 60. The amendment was rejected. Alderman Beavis took exception to the Bill as not being in accordance with the notice originally given. It was there stated that the object was to impound the water of the Kennick and Trenchford streams; but in the Bill there was no provision for the alternative scheme of raising the height of the Kennick dam. This could be carried out at a cost of £8000, and would provide as much extra storage as the proposed new dam, which would cost at least £22,000. He did not consider the scheme necessary to protect them from the riparian owners farther down the stream, for already they had the right to use all the water they could send into Torquay by their mains; and for seven months of the year they took all the water the stream yielded. The policy of the Water Committee seemed to be one of "spend as much as you can;" and the result would be an increase in the water-rate. Mr. Hutchings moved that the provision in the Bill for a reserve fund of £2000 be altered to £1000. He contended that there was no reason for anticipating an expenditure requiring a large reserve fund. On the other hand, the ratepayers took the risk of loss involved in the supply of other places, and were entitled to a fair profit, if any was to be made, in relief of the rates. Alderman Beavis seconded the amendment, which, after some discussion, was withdrawn. A clause providing that a year's salary should be paid to officials retiring through old age or infirmity was struck out; the contention being that it was an incentive to improvidence. On the motion that sanction be given to the promotion of the Bill, Alderman Bovey contended that increased storage was necessary, and that a new main which would, as Alderman Beavis had said, enable them to take the whole of the water in the brook, would be of no use unless they had more storage. The policy of the Water Committee, so far from being extravagant, had been marked by regard for the highest interests of the town. The resolution in support of the Bill was carried by 22 votes to 4.

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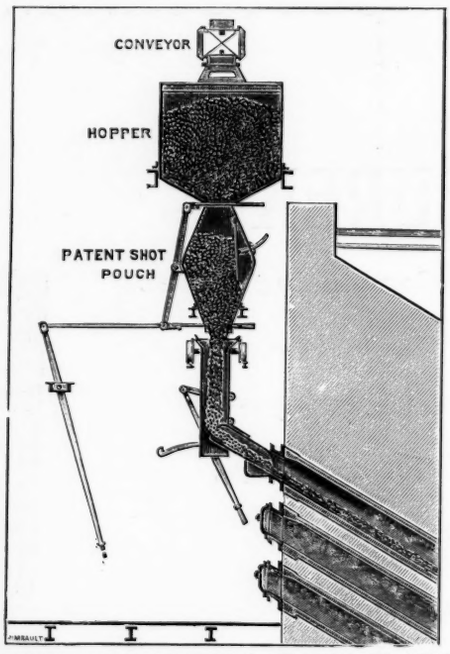

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NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

Greenock Corporation gas affairs claim my first attention this week. It was reported at a meeting of the Corporation on Tuesday that during November the bulk of gas made was 38,284,600 cubic feet, or a decrease, when compared with the corresponding month of last year, of 373,800 cubic feet; and that the quantity sent out amounted to 38,036,600 cubic feet, or 563,800 cubic feet less. Mr. Morison, the Convener of the Gas Committee, explained that the reduction in the demand for gas was mainly due to the mildness of the season; but that during the early part of December, in which the weather was more severe, the demand had been greater than it was in the corresponding period of 1901. He went on to point out that there had been a considerable increase in the amount expended upon the office staff, as compared with last year. This arose mainly from the temporary employment of an inspector to look after the extensive works the Committee had in progress. Some months ago, the Corporation declined to appoint an inspector, lest they might thereby relieve the Manager of some of his responsibility; but this officer was permitted to employ an assistant, and that had been done. The cost of the staff last month was £50, as compared with £36 in the corresponding month of last year. Mr. T. Mitchell said he objected in Committee to the employment by the Manager of a clerk of works. There was no statement in the minutes that it was left to the Manager to get a clerk of works if he thought proper to do so. No such thing was ever mooted at the Gas Committee; yet they found that Mr. Ewing had appointed a clerk, who had been working for several months before he (Mr. Mitchell) knew anything about it. He did not think Mr. Morison's explanation of the large advance of wages in the office was a reason which should be accepted by the Council. The increase in the office and in the permanent staff had been going on at an extraordinary rate; and he did not know that there had been reported in the minutes a single item authorizing the expenditure it had entailed. This was a state of things he could not allow, and would not allow, so long as he could speak in the Council. Mr. Steel did not think they should call in question the expenditure in connection with the inspection of the work now being carried out at Inchgreen. There was a lot of work being done, and it was important that every detail of it should be examined, so that in future the satisfactory and profitable working of the establishment would be attained. He thought the Manager would have been blameworthy if he had not appointed someone to see that the details of the work were carried out satisfactorily. Mr. M'Onie said he had spent an hour or two in the gas-works a few days previously, and when he looked round he was perfectly appalled. He never saw works in such a state of chaos; and this, happening at a period of the year when their capacity was taxed to the utmost, forced upon him the belief that the Council should give a generous support to the Manager. Mr. Morison, in reply, said the increase in the expenditure had been greatly exaggerated As to the appointment of a clerk of works, he really thought that he could not interfere with the Manager without interfering with his responsibility. He considered it right that, as the Manager was responsible for the work, he should select the inspector. He did not think the Council should withhold the assistance which the Manager needed, nor that they should hinder him by raising paltry questions. The Manager knew that he was not to add to the permanent staff without consulting the Committee. The subject then dropped. So far as I can see, it need never have been raised. It is evident, from the observation of Mr. Mitchell, that it originated in the Committee; and as this gentleman was the only speaker in the Council who objected to the appointment of a clerk of works, I assume that it was he who made the trouble about it. From his remarks, it may be gathered that he cherishes a special regard for the affairs of the gas undertaking. He should remember that he is not Convener of the Gas Committee now, and should forbear to complain of what his successor is doing, unless he is prepared to offer something better, which he did not do in this instance. The clerk of works is only a temporary appointment; and the charge for it will soon disappear. It was necessary there should be such an official; and his pay was bound, whoever might engage him, to come out of the coffers of the gas undertaking.

The Grangemouth Town Council and the Grangemouth Gas Company appear to live together in amity. Recently the Lighting Committee of the Corporation and the Directors and Secretary of the Company met in conference on the subject of the public lighting of the town. Under the present arrangement, the Corporation have to light the street-lamps for 3000 hours during the lighting season; but they only light them for 2250 hours. The Directors proposed to reduce the charge per lamp, and to allow a discount of 10 per cent. on the total bill, or to charge for the gas consumed as ascertained by 10 or 12 meters. They invited the representatives of the Corporation to inspect an incandescent gas-lamp they were putting up by way of experiment; and they stated their willingness to sell the undertaking to the Corporation, or to treat for the sale of it, provided the Corporation were *bonâ fide* in their willingness to treat. Nor did this exhaust the complaisance of the Directors, for they went on to offer to consider the subject of themselves introducing electric lighting, and to state what their terms for its supply would be. All this has been reported to the Corporation this week. It was also stated that the representatives of the Company were thanked by the Committee for their attendance and courtesy in meeting them, as they well deserved. The Council received the report, and sent it back to the Committee to be further considered. The opinion was expressed that meters should be put upon the lamps, and that the Corporation should pay for the gas burnt, and no more. There was also a reference to the Kitson lamp. It is apparent, therefore, that not much progress has been made in any negotiations the parties have in view.

The majority of the Falkirk Town Council, having defeated the scheme for the erection of new gas-works at Thornhill, are in straits as

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The above Company have erected since 1893, or are now erecting, their Universal Type of Carburetted Water-Gas Plant at the following Gas-Works:—

	Cubic Feet Daily.
BLACKBURN	1,250,000
WINDSOR ST. WORKS, BIRMINGHAM	2,000,000
SALTLEY WORKS, BIRMINGHAM	2,000,000
COLCHESTER	300,000
BIRKENHEAD	2,250,000
SWINDON (New Swindon Gas Co.)	120,000
SALTLEY, BIRMINGHAM (Second Contract)	2,000,000
WINDSOR ST., BIRMINGHAM (Second Contract)	2,000,000
HALIFAX	1,000,000
TORONTO	250,000
OTTAWA	250,000
LINDSAY (Remodelled)	125,000
MONTREAL	500,000
TORONTO (Second Contract Remodelled)	2,000,000
BELLEVILLE	250,000
OTTAWA (Second Contract)	250,000
BRANTFORD (Remodelled)	200,000
ST. CATHERINES (Remodelled)	250,000
KINGSTON, PA.	125,000
PETERBOROUGH, ONT.	250,000
WILKESBARRE, PA.	750,000
ST. CATHERINES (Second Contract)	250,000
BUFFALO, N.Y.	2,000,000
WINNIPEG, MAN.	500,000
COLCHESTER (Second Contract)	300,000

	Cubic Feet Daily.
YORK	750,000
ROCHESTER	500,000
KINGSTON, ONT.	300,000
CRYSTAL PALACE DISTRICT	2,000,000
DULUTH, MINN.	300,000
CATERHAM	150,000
LEICESTER	2,000,000
ENSCHEDE (HOLLAND)	150,000
BUENOS AYRES (RIVER PLATE CO.)	700,000
BURNLEY	1,500,000
KINGSTON-ON-THAMES	1,750,000
ACCRINGTON	500,000
TONBRIDGE	300,000
STRETFORD	500,000
OLDBURY	300,000
TODMORDEN	500,000
SALTLEY, BIRMINGHAM (Third Contract)	2,000,000
YORK (Second Contract)	750,000
ROCHESTER (Second Contract)	500,000
NEWPORT (MON.)	250,000
TOKIO, JAPAN	1,000,000
PERNAMBUCO (Brazil)	125,000
MALTON	150,000
DULUTH, MINN. (Second Contract)	300,000
BROCKVILLE (ONT.)	250,000

Complete Gas-Works at NELSON, BRITISH COLUMBIA.

LEEDS, 1,800,000 Cub. Ft. SMETHWICK, 500,000 Cub. Ft. LEICESTER (2nd Cont.), 1,000,000 Cub. Ft.
GRAVESEND, 300,000 C. Ft. NEWPORT, MON. (2nd Cont.), 250,000 C. Ft. TORONTO 3rd Cont.), 750,000 C. Ft.

to what to do. The alternative proposal to acquire properties in the neighbourhood of the gas-works, in order to allow of temporary arrangements being made for increasing the supply of gas, has been found to be too costly, and it will very likely drop out of notice. What the majority are clamouring for now is an inquiry into the cost of those properties and the whole gas question. This proposal came before the Town Council on Monday, and was discussed at some length. But the discussion was all upon the proposed inquiry into the gas question. Probably the majority were not prepared for the unanimity with which their proposal was accepted, for not only was there no counter-motion, but those who might have been expected to oppose the inquiry were in thorough accord with it. Inquiry will do no harm, except from the fact that its being allowed is a reflection upon the actions of those who have been inquiring for the past seven years. But these gentlemen were generous enough to take no notice of that circumstance. I suppose that, having inquired, they are satisfied that something must be done; and they know that if the majority make an inquiry which is at all thorough, they must also arrive at a like conclusion.

Under the influence of what must be looked upon as panic, a meeting of ratepayers of Arbroath was held on Thursday, "in order to gather the feeling of the town regarding the whole question of the water supply previous to the Magistrates and Town Council taking further steps to carry out their resolution of the 27th of October last." The meeting was called by Provost Grant, on a requisition by ratepayers. A resolution was moved to the effect that they strongly disapprove of the action of the majority of the Council in hurriedly proposing to abandon the Nolt Loan supply in favour of a gravitation scheme, before thoroughly testing the local sources for augmenting the supply, and asking the Council to rescind their resolution of the 27th of October; that they endorse the policy of giving consideration, in the first place, to securing a sufficient domestic supply, with salt water supply for sanitary purposes if found necessary; and that no costly scheme of gravitation be entered upon without first ascertaining the wishes of the ratepayers by a plebiscite. Referring to the gravitation scheme, the mover said he did not believe an augmentation of 720,000 gallons per day could be obtained from the Noran for much less than £200,000, which would mean that an assessment of 2s. 6d. in the pound would be required for it. He questioned the capability of the town to stand the enormous strain which would be put upon it in bringing in a gravitation supply in face of the existing condition of trade and the prospects of the staple industry of the town as well as others. A counter-motion was made that the meeting homologate the actions of the Council; and in support of this it was said that Forfar, which is about half the size of Arbroath, brought in a gravitation scheme, at a cost of £51,000, and that Arbroath could afford to spend double what Forfar had done. The resolution was adopted by a large majority.

The Directors of the Gandy Belt Manufacturing Company have declared the usual dividend on the 5½ per cent. preference shares for the half year ending the 31st inst.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *Dec.* 20.

Sulphate of Ammonia.

Although there has been less activity in the market, there has been steady buying, and prices have been maintained at £11 16s. 3d. per ton f.o.b. Hull, £11 18s. 9d. per ton f.o.b. Liverpool, and £12 per ton f.o.b. Leith. Consumers abroad have scarcely yet come into line with the advance; and consequently the bulk of the buying has again been for covering December contracts. There has been large inquiry in the forward position, but the views of buyers are scarcely above spot prices, while makers are for the most part refusing to quote, and speculators also seem nervous about offering ahead.

Nitrate of Soda.

This is unchanged, for although dealers are quoting 8s. 10½d. to 9s. per cwt. for spring delivery, they cannot cover at less than about 9s. 1½d. per cwt. Spot prices remain at 9s. per cwt. for ordinary quality, and 9s. 3d. for refined.

LONDON, *Dec.* 20.

Tar Products.

The markets, as a rule, are quiet, doubtless owing to the approach of the Christmas holidays. In benzol, there is nothing fresh to advise. An offer of 10½d. all over next year is reported to have been declined for 90 per cent. by London refiners. Crude carbolic continues very quiet, doubtless owing to navigation having been interrupted on the Continent, which has had an influence on the market for prompt delivery. There is very little doing in crystals, but prices remain in the same position. The demand for pitch, for home consumption, continues very good. But there does not seem to be much inquiry from the Continent for early delivery, and, as regards South Wales, consumers appear to be well supplied for the time being. Solvent and toluol remain very quiet, and prices are purely nominal. Creosote is firm; and, so far as London is concerned, there is really nothing offering for early delivery.

The average values during the week were: Tar, 21s. to 26s. Pitch, London, 57s. 6d. to 58s. 6d.; east coast, 54s. 6d. to 55s. 6d.; west coast, 53s. 6d. to 54s. Benzol, 90 per cent., 10d.; 50-90 per cent., 8¼d. to 8½d. Toluol, 8d. Crude naphtha, 3¼d.; solvent naphtha, 8½d. to 9½d.; heavy naphtha, 9d. to 10d. Creosote, London, 1⅞d.; North, 1¾d to 1½d. Heavy oils, 2d. to 2⅛d. Carbolic acid, 60 per cent., 1s. 8d. Naphthalene, 35s. to 55s.; salts, 23s. 6d. to 26s. 6d. Anthracene, "A," 1⅛d. to 1¾d.; "B," 1d. nominal.

Sulphate of Ammonia.

The market is very firm, and the demand continues good, especially for forward delivery. The Gaslight and Coke Company still decline to offer in any position; but another large London Gas Company have accepted £12 for early shipment, on their own terms. Business in

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Hull has been done at £11 15s. to £11 16s 3d., December shipment; but sellers ask considerably higher prices for January. In Leith, business is reported at £12 for early shipment; but makers decline to accept this price for January-June. In Liverpool, the market continues steady. Business has been done at £11 16s. 3d. to £11 17s. 6d. for early shipment. The demand for prompt is certainly not very strong at the moment; but for forward delivery that is a very good inquiry.

COAL TRADE REPORTS.

Lancashire Coal Trade.

The close of the year is bringing forward some business of inquiry for most classes of fuel; and generally pits are on full time, with all the output moving readily away. There is, however, no actual pressure of orders, and prices are not more than maintained at the list basis rates. For house-fire coals, a fairly active inquiry is reported; and in odd cases pits are filling up a little out of stock to carry merchants and consumers over the holidays. Prices at the pit-mouth are strong at about 15s. up to 16s. per ton for best coals, 13s. to 14s. for seconds, and 10s. 6d. to 11s. 6d. and 12s. for common sorts. Steam and forge descriptions are in moderate request; but there is still no increase of actual requirements. Prices are steady at about 8s. 3d. and 8s. 6d., up to 9s. per ton for good ordinary qualities at the pit-mouth. Moderate inquiries continue to be reported for supplementary supplies of gas coals; and for these prices are firm on the basis of the rates quoted last week, averaging 9s. to 9s. 3d. per ton for Wigan four-feet, and 10s. to 10s. 3d. for best screened Wigan Arley gas coal. The better sorts of slack still meet with a ready sale, and here and there collieries are rather short of supplies; but there is too much engine fuel of the medium and lower qualities on the market to enable any better prices to be obtained. At the pit, best slack is firm at from 6s. 6d. to 7s. per ton, medium sorts are 5s. 3d. to 5s. 9d., and common slack 4s. 3d. to 4s. 9d. For shipment, there is a tolerably good demand, especially where cargoes are required during the ensuing holidays; and for these slightly advanced prices are being quoted. At the ports on the Mersey, good ordinary steam coals just now range from 10s. 6d. to 11s. per ton.

Northern Coal Trade.

The coal trade is active; and the continuance of an abnormal demand for the United States has so far stiffened the markets and given full employment to some of the steam coal collieries at a time when they would otherwise have had only partial work. In steam coals, the demand is steady; and the price is from 11s. 3d. to 11s. 6d. per ton f.o.b. Second-class steam coals are 10s. to 10s. 9d., and steam smalls are from 5s. 3d. to 5s. 6d., with a fair demand for any quantity available for delivery this month. In the gas coal trade, the deliveries on contract are at the highest point, and leave little coal for occasional sale. For any such surplus high prices are asked. About 9s. 9d. to 10s. per ton f.o.b. is the general quotation; while the contracts seem to be based on figures near 8s. 10½d. to 9s., if for a period of some duration. Deliveries of gas coal are this week well kept up, work at the collieries being full. Gas coke is steady, though the demand is now fully met. The price is exactly as last quoted; 14s. per ton being asked for early delivery.

Scotch Coal Trade.

While there is fair activity, and the output is being quite taken up, it cannot be said that the prospect has improved for the coal-owner. Short term contracts are very common, from which several things might be deduced, the most manifest of which, however, is that there is a want of confidence in the trade. The prices quoted are: Main 9s. to 9s. 3d. per ton f.o.b. Glasgow, ell 10s. 3d. to 11s. 3d., and splint 11s. to 11s. 6d. The shipments for the week amounted to 212,447 tons—a decrease of 9626 tons upon the previous week, but an increase of 38,106 tons upon the corresponding week of last year. For the year to date, the total shipments have been 10,620,577 tons—an increase of 1,151,739 tons upon the same period of last year, which is highly satisfactory.

Public Lighting in North London Suburbs.—It is the custom in Finchley to extinguish all the public lights at midnight on Sundays and at 1 a.m. throughout the rest of the week. In the adjoining district of Friern Barnet a similar custom prevails; and it is alleged that both districts are burglars' paradises in consequence. At the Highgate Petty Sessional Court recently, while a burglary case was being investigated, the police informed the Bench that the burglary was committed in the Friern Barnet district, where the street-lamps were put out at about 11.30 p.m. and the police were much handicapped in consequence of the custom; but they could not get the District Council to alter it. At the next meeting of the Council, it was decided that the Surveyor should prepare an estimate of the cost of keeping the lamps alight all night.

Suffocated in a Gas-Main.—A fatal accident, whereby two men lost their lives, recently occurred at the Beckton Gas-Works. The men—Charles Pitts (34) and James Biggs (18)—were working in a main when they were overcome by the fumes of gas, and both perished. At an inquest held on Monday last week, a workman stated that when going home to dinner on the day of the accident he inquired for Biggs, but no one had seen him. He went to where Biggs had been working, and looking through the manhole into the gas-main saw the two men lying close together. He called for assistance, and artificial respiration was tried without effect. A foreman said the men were set to drill holes in the temporarily disused main to make a connection. The pipe had been freed from gas a week previously. The men could do the work outside, and had no business in the pipe. The Coroner said he could only surmise that the deceased went into the main to obtain some tool they had apparently dropped through the hole they made when boring. After a long discussion, the Jury returned a verdict of "Accidental death through suffocation by gas poisoning."

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Westbury Gas Company.—At the recent annual meeting of this Company, of which Mr. Norton H. Humphrys is the Managing-Director, the accounts presented for the year ending the 30th of September showed a working profit of £616; the balance available for distribution being £306. Dividends for the half year at the rate of 7 per cent. per annum on the original, and 4·9 per cent. per annum on the new shares, were declared.

WANTED, FOR SALE, CONTRACT, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

SITUATIONS VACANT.
- CLERK AND SECRETARY. Great Wigston Gas Company. Jan. 1.
- CLERK AND TIMEKEEPER. Forbes Waddell, Broughty Ferry.
- DRAUGHTSMAN. Dempster, Elland.
- ENGINEER AND MANAGER. Reading Gas Company. Jan. 12.
- MAIN AND SERVICE LAYER. Kidsgrove Gas-Works.
- OUTDOOR INSPECTOR. Mitcham and Wimbledon Gas Company. Jan. 12.
- WORKING FOREMAN. St. Mary Church Gas-Works.
- WORKING MANAGER. Wallingford Gas Department. Dec. 29.

SITUATIONS WANTED.
- TRAVELLER IN GAS-STOVE TRADE. Howland, Faversham.
- WITH HYDRAULIC ENGINEERS. T. A., Sutton.

GAS ESCAPE INDICATOR FOR SALE (Patent). Medd, Twickenham.

GAS MANUFACTURING PROCESS (Free Trial Installations). Masterman, Westminster.

GAS-WORKS TO LET. Burton, *via* Carnforth.

PLANT, &c., FOR SALE.
- GASHOLDER. Wright, London.
- METERS (2000). Belfast Gas Department.
- PURIFIERS, SCRUBBER-WASHERS, GASHOLDERS, &c. Firth Blakeley, Dewsbury.
- RETORTS, HYDRAULIC MAIN, ASCENSION PIPES, &c. Bangor Gas Department.
- STATION METERS (2). Oxford Gas-Works.

PLANT, &c. (Second-Hand), WANTED.
- METERS, BRASS, COPPER, LEAD ASHES, &c. Smith, Bradford.
- ROTARY WASHER. No. 3964.

SALES OF STOCKS AND SHARES.
- BARNET GAS AND WATER COMPANY. Jan. 13.
- BROMLEY GAS COMPANY. Jan. 10.
- GUILDFORD GAS COMPANY. Jan. 13.
- HORLEY GAS COMPANY. Jan. 30.
- SOUTH METROPOLITAN GAS COMPANY.
- SHREWSBURY GAS COMPANY. Jan. 30.
- TOTTENHAM AND EDMONTON GAS COMPANY. Jan. 19.

MORTGAGE BONDS.
- SHREWSBURY GASLIGHT COMPANY.

TENDERS FOR

ASH-PANS AND FURNACE FITTINGS.
- SHEFFIELD GAS COMPANY. Tenders by Jan. 5.

CONDENSERS.
- BANGOR GAS DEPARTMENT. Tenders by Jan. 5.

FIRE-CLAY GOODS.
- NELSON CORPORATION. Tenders by Jan. 9.
- ROCHDALE GAS DEPARTMENT. Tenders by Dec. 31.

GASHOLDER.
- SOUTH MOLTON GAS DEPARTMENT. Tenders by Jan. 16.

GASHOLDER TANK (Steel).
- SOUTH MOLTON GAS DEPARTMENT. Tenders by Jan. 16.

GOVERNOR AND CONNECTIONS,
- SOUTH MOLTON GAS DEPARTMENT. Tenders by Jan. 16.

GOVERNOR AND METER HOUSE, &c.
- SOUTH MOLTON GAS DEPARTMENT. Tenders by Jan 16.

HYDRAULIC MAINS, ASCENSION PIPES, &c.
- SHEFFIELD GAS COMPANY. Tenders by Jan. 5.

METERS.
- CLACTON GAS DEPARTMENT (Prepayment). Tenders by Jan. 4.
- SOUTH MOLTON GAS DEPARTMENT (Station). Tenders by Jan. 16.

PURIFIERS.
- SOUTH MOLTON GAS DEPARTMENT. Tenders by Jan. 16

RETORT MOUTHPIECES.
- SHEFFIELD GAS COMPANY. Tenders by Jan. 5.

RETORTS, &c.
- LURGAN GAS COMPANY. Tenders by Jan. 3.
- ROCHDALE GAS DEPARTMENT. Tenders by Dec. 31.

SCRUBBER-WASHER.
- BANGOR GAS DEPARTMENT. Tenders by Jan. 5.

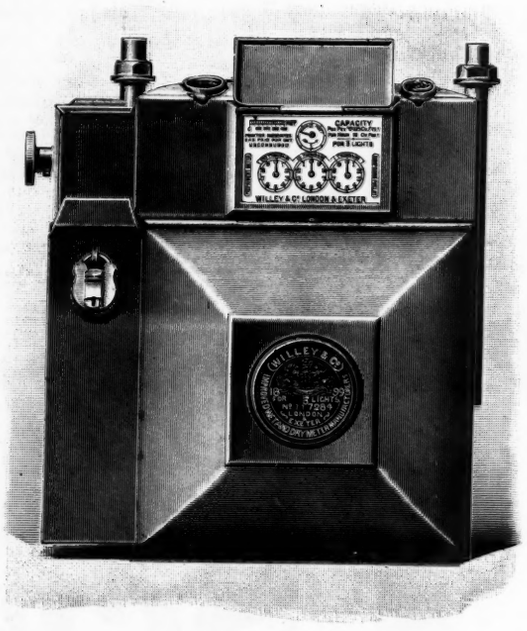
STEEL AND IRON WORK (Stage Floor, &c.).
- SHEFFIELD GAS COMPANY. Tenders by Jan. 5.

TAR AND AMMONIACAL LIQUOR.
- CLACTON GAS DEPARTMENT. Tenders by Jan. 4.
- GAINSBOROUGH GAS DEPARTMENT. Tenders by Dec. 29

QUALITY!

QUALITY!!

QUALITY!!!



Quality is our best Salesman.

WILLEY & CO., LONDON AND EXETER.

Gas Workers' Union Interference at Nuneaton.—A dispute recently occurred at the Nuneaton Gas-Works, between the stokers and the Manager (Mr. G. Helps). The men have lately joined the Gas Workers' Union, and in due course a letter was received by Mr. Helps demanding the Union rate of wages. As he was not disposed to submit to this outside interference, he gave the men a week's notice. However, they subsequently undertook to remain for two months; and the notices were then withdrawn.

Sales of Shares.—Last Tuesday, Mr. J. T. Reed (Messrs. Vasey and Reed) offered for sale £15,000 of new ordinary 5 per cent. stock of the Tynemouth Gas Company. The highest price obtained per £100 lot was £109, and the lowest £105. A few days ago, there were offered for sale, in the Royal Hotel, Coatbridge, 200 £10 shares in the Coatbridge Gas Company, bearing dividend at the rate of 7 per cent. per annum. The reserve price was £12 per share, and they were put up in lots of 10. The prices realized ranged from £14 18s. 6d. up to £15 3s. per share; the average being rather more than £15.

Ballymena Gas-Works Arbitration.—In the Board-room of the Ballymena and Harryville Gas Company, Limited, on the 15th inst., Messrs. Corbet Woodall and Joseph Hepworth sat as Arbitrators, with Mr. W. F. Cotton as Umpire, to determine the value of the Company's property, which the Ballymena District Council propose to purchase. Mr. G. R. Hume, K.C., appeared for the Company; Mr. R. F. Harrison, K.C., for the Council. Among the witnesses called for the former were Mr. W. Cash, of London, Mr. W. Nisbet, the Manager, and Mr. W. Adams, his assistant. At the close of the inquiry, the Arbitrators and Umpire inspected the works.

Suffocated by Gas.—A man and woman were recently discovered asphyxiated in a bedroom in a Southampton lodging-house. At the adjourned inquest last Friday, it transpired that the chandelier in the apartment where they slept had been drawn down, and deceased were suffocated by escaping gas. The Jury returned an open verdict.

The Huddersfield Water Compensation Case.—At the meeting of the Huddersfield Town Council last Wednesday, the Water Committee reported that a good deal of correspondence had taken place over the Brow Grains Dyke water compensation case, referred to in our "Legal Intelligence." As showing the determination of the Committee in the matter, the following resolution was passed: "That the Town Clerk be authorized to carry the subject, and all questions involved therein, to the House of Lords, and generally to take such steps as he may deem advisable for safeguarding the interests of the Corporation, and bringing the whole matter to a satisfactory conclusion." The resolution was adopted by the Council.

Messrs. R. Dempster and Sons, Limited, of Elland, have received the order from the North Shore Gas Company, Sydney (N.S.W.), for complete purifying apparatus, consisting of four 25 feet square purifiers on Green's system.

The Portsea Island Gas Company, having decided to work up their ammoniacal liquor, have entrusted Messrs. C. & W. Walker, Limited, with the order for a complete sulphate of ammonia plant of the most modern form. The work will be carried out in accordance with the designs, and under the superintendence, of Mr. J. D. Ashworth, the Company's Engineer.

NOTICES TO CORRESPONDENTS, ADVERTISERS, AND SUBSCRIBERS.

No notice can be taken of anonymous communications. Whatever is intended for insertion in the "JOURNAL" must be authenticated by the name and address of the writer; not necessarily for publication, but as a proof of good faith.

COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office NOT LATER than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

Orders for Alterations in, or Stoppages of, PERMANENT ADVERTISEMENTS should be received by the FIRST POST on SATURDAY.

Wanted, For Sale, and Tender Advertisements, Six Lines and under 3s.; each additional Line, 6d.

TERMS OF SUBSCRIPTION to the "JOURNAL."

One Year, 21s.; Half Year, 10s. 6d.; Quarter, 6s. 6d.

Payable in Advance. If credit is taken, the charge is 25s. a year.

All Communications, Remittances, &c., to be addressed to WALTER KING, 11, BOLT COURT, FLEET STREET, LONDON, E.C.

Telegrams: "GASKING, LONDON." Telephone: P.O. 1571a Central.

GAS PURIFICATION AND CHEMICAL COMPANY, LIMITED.

OXIDE OF IRON.

O'NEILL'S Oxide has a larger annual sale than all other Oxides combined. Purity and uniformity of quality guaranteed.

JOHN WM. O'NEILL, Managing Director,
160, 161, & 162, PALMERSTON HOUSE,
OLD BROAD STREET,
LONDON, E.C.

ANDREW STEPHENSON, AGENT. All communications RE OXIDE to the COMPANY as above.

WINKELMANN'S

"VOLCANIC" FIRE CEMENT.

Resists 4500° Fahr. Best for GAS-WORKS.

ANDREW STEPHENSON, 182, Palmerston House, Old Broad Street, London, E.C. "Volcanism, London."

GAS TAR wanted.

BROTHERTON AND CO., LTD., Tar Distillers. Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

TO GAS AND WATER OFFICIALS.

HIGH CLASS CYCLES at lowest Prices guaranteed and sent on APPROVAL for Cash or GRADUAL PAYMENTS. Catalogue and Testimonials from Gas Managers post free.

MELROSE CYCLE COMPANY, COVENTRY.

SULPHURIC ACID for Sale.

BROTHERTON AND CO., LTD., Chemical Manufacturers. Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

IT is worth your while to buy direct. THE RELIANCE LUBRICATING OIL COMPANY 19 and 20, Water Lane, Great Tower Street, London, E.C., handle all kinds of Lubricating Oils, for Engines, Cylinders, Dynamos, Spindles, &c., Burning Oils, Solar Distillates, Carburetting Oils, and Spirits for Gas Making; Motor Oils, Fuel Oils, Animal, Fish, and Vegetable Oils, &c., for all purposes. Write for our "Trade Mark" Inkstand, sent free to customers. Non-customers, 2s. 6d. each. RELIANCE LUBRICATING OIL COMPANY, London, Glasgow, Newcastle-on-Tyne, &c. Established 1858. Telegraphic Address: "Subastral," London; A.B.C. Code used. Telephone No.: Avenue 5891.

NEW GAS PLANT CEMENT.

JOHN E. WILLIAMS AND CO.,
VICTORIA PAINT WORKS,
MANCHESTER.

For all Joints in connection with Oil-Gas Plant and Sulphate Plant.
For all Gas Joints.
For all Tar Joints.
For all Ammonia Joints.

BROTHERTON & CO., LIMITED.

Offices: Commercial Buildings, LEEDS. Correspondence invited.

J. & J. BRADDOCK (Branch of Meters Limited), Globe Meter Works, OLDHAM, and 45 & 47, Westminster Bridge Road, LONDON, S.E.

First-Class Award, Melbourne Exhibition, 1889, for WET AND DRY GAS-METERS, STATION METERS, AND GOVERNORS, PRESSURE-GAUGES, STREET LAMPS AND PILLARS, &c.

Telegraphic Addresses:
"Braddock, Oldham." "Metrique, London."

DUTCH OXIDE OF IRON.

EERSTE Hollandsche Yzererts Maaty (First Dutch Bog Ore Company, Ltd.), ROTTERDAM.

General Manager (for England and Wales)—
CHARLES E. FRY, LEAMINGTON; and at Tower Chambers, Brown Street, MANCHESTER.

London Managers—
E. PADFIELD & CO., 96-98, Leadenhall Street, LONDON, E.C.

General Manager (for Scotland)—
J. B. MACDERMOTT, 11, Bothwell St., GLASGOW.

HYDRATED OXIDE OF IRON.

PREPARED from Pure Iron.

Twice as Rich as Bog Ore.
Gives no Back Pressure.
The Cheapest in the Market.
Can be Lent on Hire.
Can be Exchanged for Spent Oxide.

READ HOLLIDAY AND SONS, LTD., HUDDERSFIELD.

PENNY-IN-THE-SLOT WORK.

H. GREENE & SONS, Ltd., are pre- pared to give QUOTATIONS to Gas Companies or Corporations for FITTING UP COMPLETE and CARRYING OUT the WORK in its entirety, either in Iron or Compo.

19, FARRINGDON ROAD, LONDON, E.C.
Telegrams: "LUMINOSITY."

PATENTS AND TRADE MARKS PUBLICATIONS. "MERCHANDISE MARKS ACT, and Decisions thereunder," 1s.; "TRADE SECRETS v. PATENTS," 6d.; "DOCTRINE of EQUIVALENTS, Mechanical and Chemical," 6d.; "SUBJECT-MATTER of PATENTS," 6d.

MEWBURN, ELLIS, & PRYOR, Chartered Patent Agents, 70 and 72, Chancery Lane, London, W.C. Telegrams: "Patent London." Telephone: No. 249 Holborn.

ADVERTISER wants Position with Hydraulic Engineers. Workshop training; also Eight Years' Experience with London Hydraulic Power Company as Inspector of Mains and Machinery. Age 32.

Address T. A., "Wavelet," Sherwood Park Road, Sutton, SURREY.

WANTED, immediately, a Working FOREMAN for Works making 27 millions. Must be sober and steady, able to make Sulphate, and understand the working of Regenerative Settings. One who can do light repairs preferred. Wages 30s. per week.

Apply, by letter, enclosing References, to the MANAGER, St. Mary Church Gas-Works, TORQUAY.

COAL GAS TAR wanted.

Gas Managers in Gloucester, Somerset, Worcester, Devon, Wilts, Hereford, Monmouth, and Glamorgan PLEASE NOTE. BEST PRICE offered either on Fixed or Sliding-Scale Basis.

State Quantity to offer for Prompt and Forward Delivery.

The SHARPNESS CHEMICAL COMPANY, Tar Distillers Sharpness Docks, GLOS.

OXIDE OF IRON.

FIRE Cement, Paint, Mains, Tubes STREET LANTERNS, GLASS, TOOLS, &c.
BALH & CHURCH,
5, CROOKED LANE, CANNON STREET,
LONDON, E.C.

SULPHATE OF AMMONIA SATURATORS and LEAD WORK for Sulphate of Ammonia Plants.

For REPAIRS or ALTERATIONS, ring up "0848 BOLTON," or Telegraph "SATURATORS, BOLTON."

Largest Practice and most Up-to-Date Works in Britain.

JOSEPH TAYLOR AND CO., CENTRAL PLUMBING WORKS, BOLTON.

AMMONIACAL LIQUOR wanted.

BROTHERTON AND CO., LTD., Ammonia Distillers. Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

MR. S. J. HOWLAND, late with Messrs. John Wright and Eagle Range, Limited, desires position as TRAVELLER. Good References.

Address 55, Newton Road, FAVERSHAM.

EXPERIENCED Draughtsman wanted, accustomed to Designing and Detailing Gas Apparatus.

Apply, stating Experience, Age, and Salary required, to R. DEMPSTER & SONS, LIMITED, ELLAND.

THE Proprietors of a New Process by which Gas can be very profitably MANUFACTURED and SOLD at 3s. 6d. PER 1000 CUBIC FEET in any part of the country, are prepared to equip on trial a limited number of existing installations.—Towns not exceeding 1000 lights preferred—free of charge, and without interference with present lighting system.

Apply to C. E. MASTERMAN, Assoc.M.Inst.C.E., 28, Victoria Street, WESTMINSTER, S.W.

MITCHAM AND WIMBLEDON DISTRICT GAS-LIGHT COMPANY.

THE above Company require a thoroughly competent OUTDOOR INSPECTOR. He must be under 35 Years of age, and have had previous experience. Salary to commence at about £100 per annum.

Applications, by letter, stating Age, Qualifications, Experience, and Salary required, accompanied by *copies* of recent Testimonials, to be sent in before the 12th of January next, addressed to BENJAMIN GREEN, Secretary and Manager, Gas-Works, Mitcham, SURREY.

WANTED, a Clerk and Time-keeper. Trustworthy, accurate, and accustomed to routine of practical department. Hours, Six to Six.
State Wages, Qualifications, &c., to FORBES WADDELL, BROUGHTY FERRY.

WANTED, at once, a Young Man for MAIN and SERVICE LAYING, and to make himself generally useful. Permanent job. 30s. per week.
Apply, stating Experience, with *copies* of recent Testimonials, to JAMES BEECH, Gas-Works, Kidsgrove, STAFFORDSHIRE.

GREAT WIGSTON GAS COMPANY.

WANTED, a Clerk to act as Secretary and COLLECTOR. Must be able to read Meters, thoroughly efficient in Book-keeping, and with good address. Age not to exceed Forty Years. Salary £90 per annum.
Applications, in Candidates own handwriting, and accompanied by *copies* of Three recent Testimonials, by Jan. 1, 1903, to JOHN A. HARRIS, Manager, Gas-Works, WIGSTON, endorsed "Application for Secretary."

BOROUGH OF WALLINGFORD.

THE Gas Committee of the Corporation require the Services of a Competent WORKING MANAGER. Wages £2 per week, with good seven-Roomed House, Garden, Coal, Gas, and Rates free.
Must be a good Mechanic and Carbonizer, able to lay Mains and Services, fix Meters, and effect ordinary light Repairs to the Plant. The Sale of Gas is about 8,500,000 cubic feet per annum.
Applications, with not exceeding three Testimonials, to be sent to the Town Clerk, Wallingford, endorsed "Gas Manager," not later than the 29th of December inst.
Wallingford, Dec. 13, 1902.

READING GAS COMPANY.

GAS ENGINEER AND MANAGER.

THE Directors of the above Company require the services of an experienced GAS ENGINEER and MANAGER.
He must not be less than Thirty nor more than Forty-Five Years of Age, and must have had a thorough practical experience of Gas Manufacture in all its Branches, including the Design and Construction of Modern Gas-Works Plant.
Applications (which will be treated in confidence), stating Salary required, Age, and giving a detailed account of previous Training and Experience, together with *copies* of not more than Four Testimonials, should be sent to me on or before Monday, Jan. 12, 1903, endorsed "Application for Engineer."
Canvassing will disqualify.
By order,
ARTHUR H. CANE,
Secretary.
7, King Street, Reading,
Dec. 9, 1902.

TO BE LET—The Burton Gas-Works for a Term of Years. Possession March 28, 1903. Tenders taken to Jan. 20.
Apply L. H. NUTTER, Burton, *viâ* CARNFORTH.

WANTED, old Disused Gas-Meters, BRASS, COPPER, and LEAD ASHES for Cash.
J. SMITH, Broker, Canal Road, BRADFORD.

TO BE SOLD—Gasholder, Two Lifts, with Five Columns, 43,000 feet capacity, which can be increased to 49,000 feet if preferred.
Write J. WRIGHT, 181, QUEEN VICTORIA STREET, E.C.

FOR SALE—A New Patent Gas Escape INDICATOR, to avoid Gas Explosions or Suffocation.
Apply to G. MEDD, 80, Queen's Road, TWICKENHAM.

FOR SALE—Early next Year, Two STATION METERS, each for 30,000 feet per hour, by A. Wright and Co. Cylindrical cases, in good order, now working, with 12-inch Valves and Connections. Suitable for Water Gas.
Can be seen at the GAS-WORKS, OXFORD, on application to the ENGINEER.

GAS PLANT for Sale—I can always offer NEW and SECOND-HAND GAS APPARATUS, including Retorts and Fittings, Condensers, Exhausters, Scrubbers, Washers, Purifiers, Gasholders, Tanks, Valves, Connections, &c. Also a few COMPLETE WORKS. Compare Prices and Particulars before ordering elsewhere.
J. F. BLAKELEY, Gas Engineer, Thornhill, DEWSBURY.

THE Gas Committee of the Belfast Cor- poration invite OFFERS for about 2000 old Two-Light Dry METERS, which have been repaired and placed in working order.
Particulars may be had on application to the undersigned.
By order of the Committee,
JAMES STELFOX,
Engineer and Manager.
Gas-Works, Belfast.

RETORTS AND RETORT MATERIALS.

THE Lurgan Gas Company invite pro- posals for the supply of RETORTS, 9 ft. 5 in. over all by 24 in. by 15 in. inside, and for RETORT MATERIALS. All delivered at the Company's Works, Lurgan.
Proposals to reach me not later than the 3rd of January, 1903.
FRED. W. MAGAHAN,
Secretary.
Lurgan, Dec. 19, 1902.

ANY Gas Company desirous of Selling a good Second-hand ROTARY WASHER to pass ¾ Million cubic feet in Twenty-Four Hours, please write to No. 3964, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

CLACTON URBAN DISTRICT COUNCIL.

GAS-METERS.

THE above Council are prepared to re- ceive TENDERS for the supply of PREPAYMENT and ORDINARY METERS.
Full Particulars can be obtained upon application to Mr. S. Francis, the Council's Engineer.
Tenders, sealed and endorsed "Tenders for Meters," to be delivered to the undersigned not later than Four o'clock on Monday, the 4th of January next.
The Council do not bind themselves to accept the lowest or any Tender.
GEO. T. LEWIS,
Clerk to the Council.
Town Hall Buildings,
Clacton-on-Sea, Dec. 17, 1902.

CLACTON URBAN DISTRICT COUNCIL.

TAR.

THE above Council are prepared to re- ceive TENDERS for the purchase of the surplus TAR produced at their Gas-Works for the ensuing Twelve Months.
Particulars can be obtained from Mr. S. Francis, the Council's Engineer, Town Hall, Clacton-on-Sea.
Sealed Tenders, endorsed "Tender for Tar," to be delivered to the undersigned not later than Four o'clock on Monday, the 5th of January next.
The Council do not bind themselves to accept the lowest or any Tender.
GEO. T. LEWIS,
Clerk to the Council.
Town Hall Buildings,
Clacton-on-Sea, Dec. 17, 1902.

URBAN DISTRICT COUNCIL OF BANGOR, CO. DOWN.

THE Council of the above District in- vite OFFERS for Four FIRE-CLAY RETORTS, each 9 ft. by 24 in. by 15 in. with HYDRAULIC MAIN, ASCENSION-PIPES, MOUTHPIECES, &c., for same, and other Ironwork belonging thereto. All unused.
The whole of the above can be seen on application to the Manager, Gas-Works, Bangor.
Tenders to be delivered at the Town Clerk's Office, Town Hall, Bangor, not later than Twelve o'clock noon on the 19th of January, 1903.
JAMES MILLIKEN,
Clerk to the Council.
Town Hall, Bangor, Co. Down,
Dec. 19, 1902.

URBAN COUNCIL OF BANGOR, CO. DOWN.

TENDERS FOR SCRUBBER-WASHER AND CONDENSERS.

THE Council of the above District in- vite TENDERS for the supply and fixing of One SCRUBBER-WASHER capable of dealing with 240,000 cubic feet of Gas per diem. Also for the supply and fixing of ANNULAR CONDENSERS.
Further Particulars on application to the Gas Manager.
Tenders will be received by me up till Four o'clock p.m., on Monday, Jan. 5, 1903.
The lowest or any Tender not necessarily accepted.
The successful Contractor or Contractors, as the case may be, will be required to enter into a bond with approved sureties for the due performance of the work.
J. MILLIKEN,
Clerk to the Council.
Town Hall, Bangor, Co. Down,
Dec. 19, 1902.

GAINSBOROUGH URBAN DISTRICT COUNCIL.
(GAS DEPARTMENT.)

TENDERS FOR AMMONIACAL LIQUOR.

THE Gas Committee of the above Council are prepared to receive TENDERS for the purchase of the AMMONIACAL LIQUOR produced at their Gas-Works, for a period of Twelve Months from the 1st of January, 1903.
Further Particulars may be obtained on application to the undersigned.
Sealed and endorsed Tenders, addressed to the Chairman of the Gas Committee, must be delivered at the Gas-Works, Gainsborough, not later than Monday, Dec. 29, 1902.
The Committee do not bind themselves to accept the highest or any Tender.
JOHN BALDWIN,
Manager.
Gas-Works, Gainsborough,
Dec. 17, 1902.

ROCHDALE CORPORATION.

TO RETORT MAKERS AND OTHERS.

THE Gas Committee of the above Cor- poration invite TENDERS for the supply of such quantities of RETORTS and other FIRE-CLAY GOODS as may be required during the Year ending the 31st of December, 1903.
Form of Tender and any further Information may be obtained on application to Mr. T. Banbury Ball, the Manager at the Gas-Works.
Tenders, endorsed "Fire-Clay Goods," must be sent to me not later than noon on Wednesday, the 31st of December next.
Contractors who intend to sub-let part of their Contracts must forward with their original Tenders a list of the names of their sub-contractors.
By order,
JAMES LEACH,
Town Clerk.
Town Hall, Rochdale,
Dec. 18, 1902.

NELSON CORPORATION.

FIRE-CLAY GOODS.

THE Gas Committee invite Tenders for the supply of FIRE-CLAY GOODS for Season 1903.
Specification and Form of Tender may be obtained on application to Mr. A. J. Hope, Engineer and Manager, Gas-Works, Nelson.
Tenders, endorsed "Fire-Clay Goods," and addressed to the undersigned, must be received not later than Jan 9, 1903.
The Committee do not bind themselves to accept the lowest or any Tender.
J. H. BALDWICK,
Town Clerk.
Town Hall, Nelson,
Dec. 20, 1902.

BOROUGH OF SOUTH MOLTON.

GAS-WORKS EXTENSIONS.

THE South Molton Town Council invite TENDERS for the delivery and erection of—
TWO PURIFIERS.
STATION METER.
GOVERNOR AND CONNECTIONS.
GASHOLDER AND STEEL TANK.
ERECTION OF SHED FOR PURIFIERS.
ERECTION OF METER AND GOVERNOR HOUSE.
The Plans and Specifications may be seen on any week day (Wednesdays excepted) at the Office of the undersigned, to whom Tenders, on the prescribed Form, must be sent on or before the 16th day of January, 1903, and endorsed "Gas-Works Extension."
The lowest or any Tender not necessarily accepted.
R. LOUIS RICCARD,
Town Clerk.
Town Clerk's Office,
South Molton, Devon, Dec. 16, 1902.

TO ENGINEERS AND IRONFOUNDERS.

THE Directors of the Sheffield United Gas light Company invite TENDERS for the following materials for a RETORT-BENCH at their Neepsend Works.
TENDER No. 1.
For delivery only of 196 RETORT MOUTHPIECES 22 in. by 16 in. ⌂ shape, fitted with Self-Sealing Lids.
TENDER No. 2.
For delivery only of Cast-Iron ASH-PANS and FURNACE FITTINGS.
TENDER No. 3.
For the supply and erection of STEEL and IRON WORK for Stage-Floor, Girders, Buckstays, &c.
TENDER No. 4.
For the supply and erection of HYDRAULIC MAINS, ASCENSION-PIPES, GAS and TAR MAINS, &c.
Drawings may be seen, and Specifications and Forms of Tender obtained (on and after Dec. 16), from the Engineer, Mr. J. W. Morrison, at the Company's Offices, Commercial Street.
The Directors do not bind themselves to accept the lowest or any Tender.
Sealed Tenders, addressed to the undersigned (endorsed as above), must be delivered, by post, not later than the first post on Monday, Jan. 5, 1903.
HANBURY THOMAS,
General Manager and Secretary.
Commercial Street, Sheffield,
Dec. 10, 1902.

HORLEY DISTRICT GAS COMPANY.

SALE BY TENDER OF £2500 (ADDITIONAL) "B" CAPITAL STOCK.

MINIMUM PRICE—PAR.

RANKING FOR MAXIMUM DIVIDEND OF SEVEN PER CENT.

IN pursuance of the Horley District Gas Act, 1901, Notice is Hereby Given, that it is the intention of the Directors of this Company to SELL BY TENDER £2500 of the above STOCK, to be paid up in full on or before the 14th of February, 1903; such Stock being a portion of the Additional Capital authorized to be raised by Resolution passed at an Extraordinary General Meeting of the Proprietors held on the 12th day of September, 1901, under Powers of the above-mentioned Act.
Particulars and Conditions, with Form of Tender, may be obtained on application at this Office; and sealed Tenders must be sent in not later than Four o'clock in the afternoon of Friday, the 30th of January, 1903.
By order of the Board,
R. SEYMOUR TOBEY,
Secretary.
Offices: Station Road,
Horley, Surrey, Dec. 12, 1902.

BROMLEY GAS CONSUMERS' COMPANY.

ISSUE OF THREE-AND-A-HALF PER CENT. DEBENTURE STOCK.

SALE BY TENDER.

MINIMUM PRICE, £95 FOR EACH £100 STOCK.

THE Directors invite Tenders for £7000 of DEBENTURE STOCK authorized to be raised under the Bromley Gas Act, 1902, which will bear a fixed and perpetual preferential rate of interest of £3 10s. per cent. per Annum, payable Half-Yearly (subject to Income-Tax). Allotments to the highest bidders.
Tenders must be delivered on or before Saturday, the 10th of January, 1903.
Forms of Tenders, with Particulars and Conditions, may be obtained, on application, from the SECRETARY, at the Company's Offices, No. 156, High Street, Bromley, KENT; or from the Company's Bankers, Messrs. ROBARTS, LUBBOCK, AND CO., 15, Lombard Street, LONDON, E.C.
By order of the Directors,
HENRY WILLIAM AMOS,
Secretary.
Bromley, Kent,
Dec. 7, 1902.